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WEBSTER (F. M.). **The Disastrous Occurrence of *Vanessa californica* in California and Oregon during the years 1911-1912.** —*Canad. Entomologist*, xlv, no. 4, April 1913, pp. 117-120.

During the summers of 1911 and 1912, correspondents of the Bureau of Entomology, Washington, recorded the appearance of an enormous number of larvae of *Vanessa californica* doing thousands of dollars worth of damage to alfalfa at Lakeview and Waldo, Ore., and to mountain lilac, grease-wood and fruit trees in Josephine Co., South River Co. and Del Norte Co., Cal. Both butterflies and larvae came in millions, and hens and blackbirds could not check them. However, a hymenopterous parasite, *Theronia americana*, and *Helicobia helicis* destroyed fully half of the pupae. In Oregon it was noted that the myriads of butterflies headed due west.

MARSH (H. O.). **The Horse-radish Web-worm.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 109, pt. vii, 30th Jan. 1913, pp. 71-76.

Among the pests of the horse-radish at Rocky Ford, Colorado, are a flea-beetle (*Phyllotreta pusilla*, Hom.), the spinach aphis (*Myzus persicae*, Sulz.), the common cabbage worm (*Pieris protodice*, Boisd.), the diamond-back moth (*Plutella maculipennis*, Curtis) and the horse-radish web-worm (*Plutella armoracia*, Busck). The last-named species is a new and hitherto unrecorded truck-crop pest. Its larvae, pupae and adults were found on about 15 clumps of horse-radish in one garden at Rocky Ford, during the latter half of April 1911. In spite of a careful search it could not be found on horse-radish in other gardens or on various species of wild and cultivated cruciferous plants in the Arkansas valley.

Plutella armoracia is a slender moth belonging to the family HYPONOMEUTIDAE, of shy habits, and hides amongst the foliage of the infested horse-radish plants. The eggs are scale-like and deposited singly on the leaves during a considerable period, so that it is impossible to separate the generations owing to overlapping. The yellowish larvae spin a close-meshed, whitish grey web, under which they feed on the tender leaves, and later destroy the blossom buds. The yellow and brown pupae are enclosed in silver-gray cigar-shaped cocoons which are placed on the leaf petioles. There are four generations each year from March to October. A few of the larvae of the fourth generation produce moths in September, but the majority hibernate among dead leaves or in cracks in the soil and develop into moths the following April.

The increase of the *Plutella* larvae was largely checked by a small Hymenopterous insect, *Angitia plutellae*, Viereck. It is probable that the parasites live through the winter within the bodies of the hibernating *Plutella* larvae. The web-worm cannot be controlled by arsenic sprays. Burning the dead horse-radish leaves and stirring the soil about the roots would be advisable, should artificial control become necessary.

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Foster (S. W.). **The Cherry Fruit Sawfly.**—*U.S. Dept. Agric., Bureau of Entomology,* Bull. no. 116, pt. iii, 31st Jan. 1913, pp. 73-79.

In 1909 most of the cherry orchards in the Suisun Valley, Cal., showed the presence of the Cherry Fruit Sawfly (*Hoplocampa cookei*, Clarke), as much as 80 per cent. of the fruit having been injured by the larvae in one orchard. The only occurrence of this sawfly outside California seems to have been in Jackson County, Ore., where it also attacked prunes.

The eggs are deposited in the sepals or in the upper portion of the calyx of the cherry-blossom. Usually only one egg is laid in a single flower, and the eggs are deposited regardless of the variety of cherry. The time required for incubation is from three to six days. Upon hatching the larva may feed for a short time in the tissue surrounding the egg-cavity, but it soon enters the newly-formed cherry very near the stem and eats its way to the centre. After its first moult, which occurs in two to four days after entering the cherry, it seeks a new cherry and, as in the first one, eats the kernel, if soft enough. The larva may remain inside for six to ten days or even longer. A third and even fourth cherry may be destroyed, after which the larva is full-grown and works its way into the ground, where it constructs a small oval parchment-like cocoon. It remains in the cocoon until the following winter, when it pupates and emerges the following March. There is only one brood each year.

The species is occasionally heavily parasitised by an ichneumon and by a microbracon. In the Rogue River Valley, Ore., spraying with lead arsenate proved satisfactory. A spray of 1 part of nicotine sulphate to 2,000 parts of water, with 3 per cent. distillate oil emulsion, applied in the early morning was also effective. By careful cultivation of the soil many larvae could be destroyed after leaving the trees.

Johnston (F. A.). **On the Feeding Habits of** *Pimpla (Itoplectis) conquisitor,* Say.—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 144-147.

During 1912 the author observed *Pimpla conquisitor* as a parasite on *Autographa brassicae*. Two males of this species were bred from pupae of *A. brassicae* and a female was observed unsuccessfully trying to oviposit in another pupa.

In captivity the parasites were observed to oviposit in larvae of the moth, as well as in a newly formed pupa. But in some cases the *Pimpla*, after puncturing the larva, worked its ovipositor up and down, and then fed on the juices which flowed from the wound.

Herrick (G. W.). **Cherry Fruit-flies.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 79-81.

In addition to *Rhagoletis cingulata*, another little-known species, *R. fausta*, was found to be doing much injury in the cherry orchards investigated. This species had been reported

as injurious to cherries in British Columbia in 1907. The flies were first observed in the orchard on 8th June 1912. They were first seen ovipositing in the field on 24th June. The first maggots were found on 30th June. Full grown larvae emerged from cherries on 8th July. By the middle of July most of the larvae of *R. fausta* were found to be mature. The length of life of flies confined in glass cages was one month. The flies were supplied with drops of water daily and fed with crushed cherries.

A portion of the orchard was sprayed with a sweetened lead arsenate solution on 10th June, just after the flies were seen, and again on 24th June. No heavy rains fell during the intervening two weeks. It was applied to the lower branches of each tree by hand.

On 11th July, two crates of cherries, containing an average of 6,400 cherries to the crate, were picked from the sprayed portion of the orchard. The first crate, picked from the tops of the trees in the outside sprayed row, contained seventeen maggots. In the crate picked from the lower branches there were only two maggots. A crate of cherries picked from the check trees was badly infested with curculio and brown rot, and fully one-third of the fruit contained maggots. The check rows showed less and less infestation the nearer they were to the sprayed trees.

Flies captured on the check rows next to those sprayed, died in a day or so, showing that they had obtained poison by going over to the sprayed trees. All the evidence appears to show that the flies are easily poisoned and that they travel from tree to tree for a considerable distance from their place of emergence. The ordinary codling moth spray, without the addition of syrup, will control these flies.

MORRILL (A. W.). **Entomological Pioneering in Arizona.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 185-195.

The climate of Arizona is characterised by a low rainfall, low humidity, and a high percentage of sunshine. The following are the more important insect pests:—

ORTHOPTERA.—The Military Grasshopper (*Taenipoda picticornis*) breeds in the desert and feeds on mesquite till nearly full-grown, when it overruns cultivated fields, doing special damage to alfalfa, young citrus trees, and beans. These insects climb trees, fence posts, and other objects at night, evidently for protection. This habit suggests a ready means of trapping them. This strikingly marked species is apparently unpalatable to turkeys.

THYSANOPTERA.—The citrus thrips (*Euthrips citri*) is the only notable citrus pest known to occur at the present time in the State, and it has not done so much damage as in some parts of California. The flower or grain thrips (*Euthrips tritici*) does considerable damage, especially to the flowers of alfalfa.

RHYNCHOTA.—In many parts of Arizona the blood-sucking cone-nose (*Conorrhinus sanguisugus*) takes the place of the bed-bug as a household pest. The squash Capsid (*Pycnoderes quadrima-*

culatus, Guen.) is an insect which as a pest appears peculiar to the Salt River Valley. Late squashes, cassaba melons, and beans are subject to serious damage by this pest, which promises to be a difficult one to control. The common squash bug (*Anasa tristis*) thrives wherever squashes are grown. The western leaf-footed plant-bug (*Leptoglossus zonatus*) prevents the development of pomegranate-growing upon a commercial basis, and sometimes attacks oranges and ripening peaches. Various species of Aphis, particularly the melon louse (*Aphis gossypii*), the cabbage louse (*Aphis brassicae*), and the woolly apple aphis (*Schizoneura lanigera*) are common and troublesome. The grape Phylloxera (*P. vastatrix*) was discovered attacking the leaves of cultivated vines in Arizona in 1912. The best known economic leaf-hoppers are the sugar-beet leaf-hopper (*Eutettix tenella*) and two grape leaf-hoppers (*Typhlocyba comes* and *Dicraneura cockerelli*).

The soft brown scale (*Lecanium hesperidum*) depends for the most part on the oleander. The California red scale (*Chrysomphalus aurantii*) was discovered for the first time in Arizona in 1912. The Parlatoria scale (*P. blanchardi*) and the Marlatt scale (*Phoenicococcus marlatti*) both attack the date palm.

Lepidoptera.—The corn-cob worm (*Chloridea obsoleta*), codling moth (*Carpocapsa pomonella*), alfalfa butterfly (*Colias eurytheme*) and the variegated cut-worm (*Peridroma margaritosa saucia*), which also attacks alfalfa, are, in the order named, the leading lepidopterous pests in Arizona. Vine leaves are attacked by *Harrisina coracina* and *H. metallica.* The eastern peach tree borer (*Sanninoidea exitiosa*) also occurs in the State, but has done little damage as yet.

Coleoptera.—Peaches and figs are badly and generally injured by the green June beetle (*Allorrhina mutabilis*) wherever grown in the State. A small Nitidulid beetle (*Carpophilus dimidiatus*) has been found to be a serious enemy to the date palm, breeding in the fruit in enormous numbers. The Colorado potato beetle (*Doryphora decemlineata*) is not of much importance in Arizona. The bean ladybird (*Epilachna corrupta*) is one of the most destructive beetles in Arizona.

Hymenoptera.—In this order Arizona has three pests of high rank in the clover seed Chalcid (*Bruchophagus funebris*), the harvester ant (*Pogonomyrmex barbata* vars.) and leaf-cutter bees, of possibly more than one species. The clover seed Chalcid not only causes a great direct loss to alfalfa seed-growers in Arizona, but dissipates the hopes for the development of the seed-producing industry for which the State is peculiarly suited climatically, until some satisfactory method of control is worked out. The harvester ants are responsible for a large amount of damage in the alfalfa fields. In this connection a use for London Purple, not generally known, should be noted. This poison owing to its fine state of pulverisation is especially adapted for placing around the entrance of the nests of the ants, where it may adhere to the feet and be carried into the nests to poison the food supply. The leaf-cutting bees are the cause of much damage to young fruit trees in Southern and Eastern Arizona.

Britton (W. E.). **Recent Studies on the Weevil and the Bud-moth of the Walnut and a Sawfly attacking Blackberry.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 197-199.

In Connecticut, walnuts (*Juglans*) of the species *cordiformis*, *sieboldiana*, *cinerea*, *regia*, *mandshurica*, and *nigra* are infested with the walnut weevil or curculio, *Conotrachelus juglandis*, Lec. Oviposition takes place from the end of May till the beginning of August, the eggs hatching in from six to twelve days. The larvae tunnel upwards in the stems of the shoots and feed on the kernels. When mature, they go an inch into the ground, pupate ten days later, and the adults emerge sixteen to twenty days after pupating, fly to the trees and eat holes at the base of the leaf petioles. Lead arsenate in the usual proportions, applied twice, seems to be an effective check.

A bud-moth, probably *Acrobasis caryae*, Grote, tunnels downward from the terminal or an axillary bud of *Juglans regia*, *cinerea*, or *nigra*. The frass is not, as in the case of the walnut weevil, extruded laterally from the burrow, but retained and fastened to the leaves forming a nest for pupation. The moth may be destroyed in the same way as the weevil.

Pamphilus dentatus did much damage to blackberry plantations in Connecticut and has habits quite similar to those of the peach sawfly.

Morgan (A. C.) & Runner (G. A.). **Some Experiments with Roentgen Rays upon the Cigarette Beetle, *Lasioderma serricorne*, Fabr.**—*Jl. Econ. Entom.*, vi., no. 2, April 1913, pp. 226-230.

In continuation of Mr. W. D. Hunter's experiments on the effect of X-rays on insects, the authors tested an X-ray machine built for "sterilising" cigars on a commercial scale, *i.e.*, at the rate of 40,000 a day. Voltages of from 64,000 to 75,000 and exposures from a few seconds to one hour were tried, with the result that eggs, larvae, pupae, and adults of *Lasioderma serricorne* so treated did not show the slightest deviation from the normal development, as checked by control sets of the beetle.

Jones (T. H.). **Some Notes on *Laphygma frugiperda*, S. & A., in Porto Rico.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 230-236.

The fall army-worm, southern grass-worm or "el gusano de yerba" (*Laphygma frugiperda*) is widely distributed over Porto Rico, and larvae are common during the wet and slightly cooler autumn and winter months on sugar-cane, "malojillo" (*Panicum barbinode*), corn, and onions. In the areas infested with the fall army-worm, the grasslooper (*Remigia repanda*) is also common and prefers the unfolded sugar-cane leaves, while the former destroys the young leaves. Outbreaks of *Laphygma* apparently depend on climatic conditions, and the abundance of larvae following floods in Porto Rico may be accounted for by the fact

that larvae are found in the vegetable débris and soil brought down. Observations on the breeding habits have been carried out for some years at the experiment station of the Porto Rico Sugar Producers' Association at Rio Piedras. Three Tachinid flies were found parasitic on *Laphygma*, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp. Adults and larvae of a Carabid beetle, *Calosoma alternans*, F., were found in areas infested with *Laphygma*. Other natural enemies occurring in Porto Rico are lizards and two species of blackbird (*Holoquiscalus brachipterus* and *Crotophaga ani*) known locally as "el chango" or "mozambique" and "el Judio." Experiments with bran sweetened with molasses and poisoned with Paris green showed this mixture, if placed between grass land and cane plantations about to be attacked, to be a most efficacious bait for *Laphygma frugiperda*.

Haseman (L.). **Peach "Stop Back" and Tarnished Plant Bug** (*Lygus pratensis*, **Linn.**).—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 237-240.

Considerable damage to peach and pear buds in Missouri nurseries has been done in recent years by tarnished plant bugs (*Lygus pratensis*). The injury, known as "stop back," was formerly attributed to soil conditions, mites, and thrips, but it has been proved conclusively that *Lygus* is responsible. The bug does not deposit its eggs in the tissues of plants, as the ovipositor does not seem sufficiently strong, but in the blossoms of daisies, asters, clover, mare's tail (*Erigeron canadense*), &c., during the autumn. After the first heavy frosts breeding stops and the tarnished plant bugs swarm in thousands in gardens, feeding on turnips and crawling among the leaves of mullein plants. The author has been able to observe five nymphal stages from the egg to the adult form. During the summer the pest completes its life-cycle in from 20 to 25 days, and during September and October in 30 to 35 days.

All places sheltering hibernating adults should be burnt over and mullein plants carefully destroyed. Trap crops to protect peach-trees in nurseries are probably useful in spring. Spraying peach stock is far less efficacious than the use of a special machine provided with sticky shields, similar to the one used for the apple leaf-hopper. During the late summer and autumn, road-sides, vegetable gardens, and waste lands should be kept free from weeds, or the weeds sprayed regularly with a strong contact wash.

Haseman (L.). **The Apple Leaf-Hopper** (*Empoasca mali*, **Le B.**). —*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 240-243.

For years the apple leaf-hopper has caused great trouble in the Middle West, especially in Missouri. Contrary to previous opinion the pest does not hibernate in the egg stage under the bark of apple trees, but, like the grape leaf-hopper, passes the winter in the mature stage hiding under the foliage of docks, turnips, &c., along fence rows and in rubbish. A few scattered

adults are the first forms to appear in early spring, followed by a heavy brood of young which cause serious curling of the first leaves of the apple trees. Later broods appear at intervals of about four to six weeks, until the leaves begin to fall, and increase in numbers unless they are checked. After the first frost the adults leave the trees and collect in protected places for the winter.

It was found that spraying was quite an inadequate method of control, both from the points of view of efficacy and expense. As the adult oviposits in spring soon after the trees begin to grow, it occurred to the writer that a contact wash would be effective. Miscible oils and, to a lesser extent, a kerosene emulsion applied three or four times at intervals of from three to six days, destroyed the nymphs, but not the adults. A more satisfactory and cheaper method was to follow up the spraying with a trap, on the sticky shield plan, mounted on wheels. So many leaf-hoppers, tarnished plant bugs and other noxious insects were caught upon the sticky surface of the machine that it had to be cleaned and repainted twice a day, from one to three gallons of insects being removed during each cleaning. Contact oil washes for nymphs, followed up by a machine for catching the adults, is sufficient to control the pest at a moderate expense.

Townsend (C. H. T.). **The 1912 Outbreak of *Alabama argillacea* in Peru.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 244-246.

During the first few months of 1912 the cotton leaf-caterpillar multiplied in extraordinary numbers in the cotton districts from Chancay to Casma, on the Peruvian coast N. of Callao, causing a loss estimated at over £70,000. The reasons for this outbreak must be sought in the abnormal meteorological conditions during the season 1911-1912. The humidity and lack of sun during the latter half of February prevented the usual evaporation, while the exceptional heat caused a soil fermentation to set in, that rendered the cotton plant inactive during its usual period of greatest growth, and thus less resistant to the attacks of the caterpillar. At the same time heat and humidity favoured an accelerated development of *Alabama*, there being at least five and perhaps six generations from December to April. The fermentation of the soil probably killed the pupae of its Muscoid enemies, while the moths were carried from one irrigated valley to another by the strong S.E. wind. By the time the planters awoke to the importance of the outbreak little could have been done, even if arsenates or other poisons had been available.

Urich (F. W.). **Notes on some Mexican Sugar-Cane Insects from Santa Lucrecia, State of Vera Cruz.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 247-249, 1 pl.

On a sugar plantation, about 3,000 acres in extent, situated about twelve miles from Santa Lucrecia on the Coatzacoalcos River, the following insects injurious to cane were recorded

(1912):—*Tomaspis postica*, Walk., which was kept in check by a parasitic fungus, *Metarrhizium anisopliae*, Metschnikoff, and a species of *Empusa;* Reduviid bugs (*Castolus plagiaticollis*, Stål.), unfortunately parasitised by a species of *Telenomus*, were seen carrying about *T. postica* impaled on their probosces. *Diatraea saccharalis*, parasitised by *Trichogramma pretiosa*, Riley. *D. grandiosella*, Dyar, parasitised by a *Telenomus* sp. *Xyleborus affinis* was observed only on cane damaged by gophers.

Trivial damage was done by:—*Leptodictya tabida*, H. Sch.; species of *Machaerocera, Taeniopoda, Schistocerca, Neoconocephalus; Cosmocomoidea morrilli*, Howard; *Cyanopepla submacula*, Walk.; *Perimeles remus*, F.; *Cirphis* sp., parasitised by *Horismenus urichi*, Crawford.

The size of the sugar-cane, the large areas to be treated, and a scant labour supply, make artificial control, as by spraying, unfeasible. However, in Mexico there is a fair amount of natural control by insects, fungi, and lizards.

HEIDEMANN (O.). **The Sugar-Cane Tingid from Mexico.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 249-251.

Several specimens of the Hemipteron, *Leptodictya tabida*, H. Schaeff., were collected on sugar-cane at Santa Lucrecia, Vera Cruz, Mexico, in September, 1911. Although the characters of the species have been well defined, a new and more detailed description is given.

VAN DINE (D. L.). **The Insects affecting Sugar-cane in Porto Rico.** —*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 251-257.

Although sugar-cane has been cultivated in Porto Rico for nearly 400 years, it is only within the last half of the past century that insect pests affecting the crop have been recorded. In conjunction with the U.S. Bureau of Entomology the workers at the Experiment Station, Rio Piedras, P.R., have investigated the occurrence of the following injurious insects:—

Diatraea saccharalis, F. (moth stalk-borer), is responsible for the greater part of the damage; it is parasitised by *Trichogramma pretiosa, Tachinophyto* (*Hypostena*) sp., and a fungus, *Cordyceps barberi. Laphygma frugiperda*, S. & A. (southern grass-worm), usually in company with *Remigia repanda*, is often injurious to young canes after rain; three Tachinid flies, *Frontina archippivora*, Will., *Gonia crassicornis*, F., and *Archytas piliventris*, Wulp., have been bred from *L. frugiperda*. Other injurious caterpillars are *Cirphis latiuscula*, H. S., and *Prenes nero*, F., which are checked by a Braconid parasite and by blackbirds.

Lachnosterna spp. (May-beetles) in their grub stage injure the roots; kept in check by blackbirds (*Crotophaga ani* and *Holoquiscalus brachipterus*), wasps (*Campsomeris dorsata*, F., and *Elis sexcincta*, F.), and parasitic Tachinid flies (*Cryptomeigenia aurifacies*, sp. n., and *Eutrixoides jonesii*). *Metamasius hemip-*

ferus, L. (West Indian sugar-cane weevil) has been found throughout the island, but is injurious in certain districts only. *Diaprepes* sp., a weevil root-borer, not identical with *D. abbreviatus*, L., from Barbados, attacks the root-stalk of the cane in several localities. A shot-hole borer, *Xyleborus* sp., attacks diseased canes and is usually associated with the rind disease, *Melanconium sacchari*. *Diabrotica graminea*, Baly, feeds on cane leaves.

Scapteriscus didactylus, Latr. ("la changa" or mole-cricket) injures all cultivated plants and eats into the base of the young sugar-cane shoots; it is controlled chiefly by lizards, and by birds and fowls following the plough.

Termes morio, Lath. ("el comején") injures seed cane after planting.

Tettigonia similis, Walk., is frequent on cane leaves, but its breeding habits have not been observed. *Ormenis* sp., a leaf-hopper, infests cane in isolated areas. *Delphax saccharivora*, Westw., the West Indian sugar cane leaf-hopper, is not abundant and is parasitised by Strepsiptera, Mymaridae, and Dryinidae. *Sipha graminis*, Klt., and another, less common sugar-cane aphid are preyed upon by the Coccinellids *Megilla innotata*, Muls., *Scymnus loewii*, Muls., and *S. roseicollis*, Muls., and by larvae of a Syrphid and Chrysopid. *Pseudococcus sacchari*, Ckll., the sugar-cane mealy-bug, attacks the cane throughout its growth, particularly the roots of young cane, in every plantation in the island. Its chief enemies are *Aspergillus* sp. and *Cryptolaemus montrouzieri*, Muls., and it is usually associated with the ants *Solenopsis geminata*, F., and *Prenolepis fulva*, Mayr. *Taxigonia sacchari*, Ckll., is a common sugar-scale in Porto Rico, but does no particular damage.

Davis (J. J.). **The Life-Cycle of *Lachnosterna tristis*, Fabr.**—*Jl. Econ. Entom.*, vi, no. 2, April 1913, pp. 276-278.

All the eight North American species of *Lachnosterna*, known to be injurious, were supposed to have a three-year life-cycle, that of *L. arcuata* in particular having been worked out and recorded by Mr. T. Pergande. The author investigated the reproduction of several pairs of *L. tristis*, collected on oak at Lafayette, Indiana, and came to the conclusion that this beetle takes two years to develop from the time the eggs are laid until the appearance of the adults above ground, one year being the approximate total length of the grub stage. It is recorded that the grubs survived being frozen in soil for several months.

Hunter (W. D.) & Pierce (W. D.). **The Movement of the Cotton Boll Weevil in 1912.**—*U.S. Dept. Agric., Bureau of Entomology*, Circ. no. 167, 28th Jan. 1913, pp. 1-3, 1 map.

Notwithstanding a set-back, due to the very unusual climatic conditions of the winter of 1911-1912, the cotton boll weevil has gained 7,300 square miles, the total area infested being 278,800

square miles, being made up as follows:—149,700 square miles in Texas (139,300 in 1911); 40,800 sq. m. in Louisiana (stationary); 2,100 sq. m. in Oklahoma (6,300 in 1911); 25,000 sq. m. in Arkansas (33,900 in 1911); 39,200 sq. m. in Mississippi (40,500 in 1911); 18,400 sq. m. in Alabama (9,300 in 1911); 3,600 sq. m. in Florida (1,400 in 1911).

White (G. F.). **Sacbrood, a Disease of Bees.**—*U.S. Dept. Agric., Bureau of Entomology*, Circ. no. 169, 15th Jan. 1913, pp. 1-5.

In 1896 and 1898 W. R. Howard described a disease affecting larvae, pupae, and adult bees—pickled brood—as being due to a fungus, *Aspergillus pollini*. A similar disease was reported by Maassen, in 1906, as an "aspergillus mycosis in bees." The author is somewhat sceptical regarding the existence of such fungous diseases in the United States. However he has studied a disease which is neither foul brood, nor pickled brood, but causes a great weakening of the brood, which dies after the time of capping. The dead larvae are found extended lengthwise in the cell, which in many cases has been uncapped. They lose their normal colour and assume a yellowish, then a brown or grey tint. The body wall is not easily broken and they can often be removed from the cells intact. There is no odour in the brood combs. On account of the sac-like appearance of the larvae, which are filled with a watery fluid, the name "sacbrood" is suggested for the disease. Microscopical study failed to show any pathogenic organism, but it was possible to produce "sacbrood" experimentally by feeding healthy colonies with the virus of the disease. In eight out of eleven colonies the disease was produced by virus that had passed through a Berkefeld filter.

Yothers (W. W.). **Spraying for White Flies in Florida.**—*U.S. Dept. Agric.*, Circ. 168, 16th April 1913, 8 pp.

Citrus trees in Florida are liable to injury by four species of White Flies, but only two of these, *Aleurodes citri*, R. & H. (Citrus White Fly), and *A. nubifera*, Berger (Cloudy-winged White Fly), do sufficient damage at the present time to demand remedial measures, and of these, the former is by far the most injurious.

This pest was introduced into the United States from Asia, some time previous to 1879, and has spread over the whole citrus-growing region of the State westwards through the Gulf region. At present sixty per cent. of the groves in Florida are infested by it. It is found on nineteen species of trees and shrubs, the most important hosts being China trees, Cape jessamine, privet, and various species of citrus. The only native plants seriously infested are prickly ash and wild persimmon.

The eggs of the fly are exceedingly small and to the naked eye they appear to be mere particles of whitish dust on the under side of the leaves. They hatch in ten to twelve days and the larva, after crawling about for several hours, settles on the under side of the leaf. There are three moults and the larval stage lasts

approximately three days. The pupa closely resembles the last stage of the larva, and the pupal stage varies from 13 days in summer to a maximum of 304 days during autumn, winter, and spring. Both larvae and pupae secrete honey-dew. The adults remain attached to the leaves and collect in the largest numbers on the new growth; they live for about 10 days. A single female has been known to lay as many as 250 eggs, but the average is not more than 150. The adults of the first brood reach their maximum number in March or early April; the second flight of adults takes place in June, and the third in August. Eggs deposited by the third brood reach the pupal stage and thus remain on the leaves until the following spring. This brood is by far the most numerous, and the larvae and nymphs, by the extraction of sap and the excretion of honey-dew, which favours the growth of the "sooty fungus," cause the greatest damage to citrus trees.

The other species, *A. nubifera*, Berger, is distinguished by the fact that the eggs are dark and have a reticulated surface, while those of *A. citri* are greenish yellow and smooth. The pupa case of *A. nubifera* is thin and membranous and collapses after the emergence of the adult, while that of *A. citri* retains its shape indefinitely. The adults are easily distinguished, as *A. nubifera* has dark marks on its wings, whilst the wings of *A. citri* are pure white. The broods of the former appear about a month later than those of the latter.

The injury caused by these flies by loss of sap is much greater than is generally supposed, but this is of secondary importance compared with the damage caused by "sooty mould" which follows it, the two together producing a reduction in the yield of fruit which has been variously estimated at from 25 to 50 per cent. It is customary to clean fruit which has been badly attacked by "sooty mould," but this causes mechanical injury and allows of the entrance of other injurious fungi.

The author says that there are two methods of controlling these White Flies, one by fumigation of the tree with hydrocyanic gas and the other by spraying with a contact insecticide. The latter is comparatively inexpensive and is adapted to conditions in Florida. He describes the apparatus necessary in detail, and gives the following formula for the spray:—Whale oil soap, 8 lb.; paraffin oil, of 25-28 degrees Baumé, 2 gals.; water, 1 gal. For spraying orange trees one gallon of this strong mixture should be added to 50 gals. of water. This gives about 1 per cent. of oil which is the proper strength required for the White Fly and Purple Scale. The spraying may be carried out at any time of the year, except when the trees are in bloom. If it is done about two weeks after the disappearance of the adults of the first brood the best results are perhaps obtained, and as the larvae at that time are very tender the solution may be used effectively at one-half, or three-quarters the usual strength, one thorough spraying being much more effective than two or three carelessly applied. Two sprayings are sufficient to control the White Fly, either one in the spring and one in the early autumn, or one at midsummer and another in winter. The spring and summer sprays are beneficial

in killing *Eriophyes oleivorus*, Ashm. (Rust Mite), *Lepidosaphes beckii*, Newm. (Purple Scale), and *Chrysomphalus aonidum*, L. (Nail-headed Scale).

Malaquin (A.) & Moitié (A.). **Le puceron de la betterave dans le nord de la France.** [The Beet Aphis in the North of France.]—*La Vie Agricole*, ii, no. 24, 17th May 1913, pp. 696-699, 7 figs.

During the season of 1911 a visitation of *Aphis papaveris*, F., in the north of France did much damage to sugar and cattle beet, the insects also feeding on spinach, rhubarb, poppies, beans, and various other cultivated, as well as wild, plants.

The winged parthenogenetic females appear on beet-leaves from the beginning of May and deposit their brood on the under side of the leaves. In between 10 to 14 days and after four moults both the apterous and winged forms are mature and commence reproduction. About ten generations may be observed during the course of one summer. In the north of France they leave the seed-plants, which do not provide sufficient food, for the sugar and cattle beet about the middle of July. During September the sexual winged form migrates to the spindle-tree (*Euonymus*), on which the apterous non-parthenogenetic females are deposited. The winged males migrate to the spindle-tree about a fortnight later than the females. The authors estimated that there were 800 females to each male. The eggs overwinter and hatch during the first fortnight in March, giving rise, after four moults in the course of three weeks, to the "stem mothers." The latter produce an apterous generation which continues its life-cycle on the spindle-tree, and a winged generation which emigrates to the beet or other food-plants.

An effective preventive measure would be the elimination of the spindle-tree from the vicinity of beet plantations, as spraying would only prove to be a temporary remedy. Of other methods of control, entomophagous Hymenoptera (Aphidiinae and Encyrtinae) have proved to be most satisfactory, 50 per cent. of the Aphis having been attacked by them in 1912.

Lindinger (L.). *Aspidiotus bavaricus*, Ldgr.; **a Scale-insect new to the British List.**—*Entom. Monthly Mag.*, May 1913, pp. 103-104.

The author found females of this species of *Aspidiotus* on *Calluna vulgaris* from Chester and Aberdeen, which were identical with specimens from Bavaria, Styria, and Norway, and with the British scale erroneously described by Newstead as *A. ostreaeformis*. The insect is found on the subterranean part of the stem of its food-plant.

Berlese (A.). **The Control of the Japanese Fruit Scale** (*Diaspis pentagona*). — *Monthly Bulletin of Agric. Intelligence, Internat. Instit. Agric., Rome*, May 1913, pp. 697-703.

The author says that the experience of many years has shown that artificial control measures against this pest are only of value

for the season in which they are carried out, and cannot be expected to get rid of the scales permanently or sufficiently to allow of the healthy growth of the plants, consequently many growers have become disheartened and have abandoned their use.

Prospaltella berlesei, a small species of Hymenopteron, is the special endophagous parasite of *D. pentagona* introduced by the author into Italy in 1908. It was imported into Switzerland in 1912 and has established itself in the neighbourhood of Locarno. It is now also established in 37 communes in the Trentino and is spreading gradually in Göritz, Istria, and Dalmatia. The author quotes writers in various journals to the effect that once the insect is well established the scale ceases to be a pest and gives details as to the efficiency of it in many districts of Italy, and says that now the landowners and the cultivators are so convinced of its utility that there is no difficulty in spreading the parasite. He quotes Professor E. Voglino: "the countrymen about Valenza have learnt to recognise the parasitised scales perfectly, and as they all have small properties, they pick out twigs with plenty of scales and their parasites on them, at pruning time, and take them to fasten to their own trees. In some parts of Venetia the farmers who have material infected by *Prospaltella* make a regular trade of it, selling twigs of a foot long with 60 to 80 per cent. of parasitised scales for ½ a lira each (5*d.*). So great was the demand that in March many fortunate owners of parasitised mulberry trees had to watch them at night to prevent the material being stolen." The Institute at Alessandria sent out last year 37,315 separate lots of mulberry twigs. The rate of progress of the parasite is illustrated by Count Rota, who obtained one small lot in 1909. The next year he was able to obtain 100 twigs; in 1911, 500; and in 1912, 35,000. With these he has infected half his own mulberries and distributed large quantities to his friends and fellow cultivators, and this year has abundance for himself and others. Dealers in silkworms' eggs are now busy cultivating the parasite and sending it out to their clients, and the author states that there are agricultural bodies which, although possessing as much as 6 cwt. of infected branches, are so overwhelmed by requests that they have to apply to the nurseries of the Institute for more. The author is of opinion that the operation of the parasite is so thoroughly satisfactory that in a very short time it may be hoped that Italy and other countries will be free from the pest. A list of 23 papers relating to the subject is attached to the article.

Un insecto que causa graves daños a los viñedos, *Vesperus xatarti*. [An insect causing great damage to vineyards.]—*Revista del Instituto Agricola Catalan de San Isidro*, 20th Jan. 1913, pp. 23-26.

The vineyard of D. Manuel Urgellis at Llorens del Penadés has been seriously attacked during the past year by a disease greatly resembling that which the natives called "ferridura" or "apoplegia" and which kills large numbers of the vinestocks. The owner

observed large numbers of white larvae, about 1 cm. broad by 2 cm. long, which were brought to the surface when the soil around the vines was stirred and, suspecting that these were the cause of the trouble, he sent them to Dr. Jaime Nonell for identification. They proved to be the larvae of a Cerambycid, *Vesperus xatarti*, Mulsant, vulgarly known under the name of "Menge-mallols." It was first met with in Valencia by Léon Dufour in the Moxenta mountains, was described by Mulsant in 1839, and is apparently indigenous to Spain. The insects pair in January and adults are rarely found in February. The female lays about 500 eggs in cracks and crevices of the bark of the vine stalk, from which the larvae hatch in the month of April. These larvae eat the shell of the egg as soon as hatched and pass into the soil, where they undergo a further transformation and live upon the roots of the vine. It would appear that the larval stage may last as long as three years and at all times, in vineyards subject to the attack of this insect, it appears to be possible to find larvae of three distinct sizes corresponding with the first, second, and third years of life. According to M. Oliver, the larva has two annual periods of activity, one between the middle of March and the middle of April and another from the 15th September to the end of October. It does not feed vigorously during the periods of extreme heat or cold, and probably not at all during the winter, and during this resting stage it may be found at a considerable depth below the soil, without any covering whatever. It may sometimes be met with motionless on the surface of the soil or in cracks in old vinestocks and similar places. At the end of the third year, when the larva has completed its development and is ready to be transformed into a nymph, it constructs a covering of agglutinated earth at such a depth as not to be interfered with by the operations of cultivation, and in this condition it passes through the heat of summer. The perfect insect generally appears towards the end of September, and its numbers go on increasing during October, November, and December, but it is only towards the end of the last month that the males begin to appear. The adult does not appear to feed during the day-time, but hides from the light under stones, pieces of bark and the like. This habit possibly explains the fact that the larvae of *V. xatarti* are more frequently found in vineyards which are intermixed with olives, almond-trees, &c.

The larvae of *V. xatarti* are omnivorous and appear to consume the roots of grasses, holmoak, &c., but apparently prefer those of the vine. The attack of the larva is most to be feared in the young plantations, and hence the vulgar name "Menge-Mallols" by which it is known. In the first year of the existence of the plantation the runners are frequently found to be cut in two close to the root. During the first and second year growth languishes in the month of June and a short time afterwards the stocks die. If the affected plant be pulled up it will be found that there is a circular incision around the principal joint. In the third year a complete annular incision is not generally found, but the attack of the larva is nevertheless evident enough. The

vine stock certainly resists, but after some time, as the result of repeated attacks, it dies. Most of the loss of vines attributed to "apoplegia" by the peasants is to be explained as the result of the attack of these larvae. The best method of diminishing the attack is to capture the largest possible number of adult insects. This should be done before the end of December, because, as stated above, mating takes place between the end of December and the early days of February. Wood fires or powerful lights in the neighbourhood of the vineyards are found to be effective. The females seek the trees such as olives, almonds, &c., which are to be found in the neighbourhood of the vineyards, and it is very desirable where such trees are planted to prevent the insects from climbing up by the use of some such mixture as the following:— tar 700 grms., resin 500 grms., soft soap 500 grms., whale oil 300 grms. The tar and the resin are heated together and when they are thoroughly liquid the soap and then the oil is added, stirring the while, the stirring to be continued, after removal from the fire, until the mass is completely cold. In the month of February the only thing to be done is to attempt to destroy the eggs which are laid underneath the bark in cracks, &c., and to strip the bark where possible. The larvae may be destroyed during the active periods in spring and summer, for they then live closer to the surface of the soil and can be turned up by raking and shallow digging. Bisulphide of carbon injected into the soil in winter at 25 centimeters from each vine stock in doses of 7 grms. has been found to be useful, though it may be necessary to repeat the operation 2 or 3 times. It is also recommended to cultivate leguminous plants, beans, &c., between the vines; the larvae attack these and as soon as they are seen to be suffering, the plants can be dug up and the larvae at their roots destroyed.

Jentink (Dr. F. A.). **Hemp as a Deterrent of *Pieris brassicae*.**

Dr. F. A. Jentink, Director, Rijks Mus. Nat. Hist. Leiden, writes (22nd May 1913):—"Perhaps it may interest the readers of your journal to know that when I was a boy, some 50 years ago, my father always planted hemp (*Cannabis*) between the rows of cabbages, as we did not like the visits of *Pieris brassicae*. What Prince P. D'Arenberg relates as a *novum* ('Review of Applied Entomology,' Vol. I., A., March 1913, p. 68) was therefore *a long known* fact, at least 50 years ago, among the peasants in Frisia (Holland)!"

Newport (H.). **Market Gardening in the Mining Districts.** — *Queensland Agric. Jl.*, Jan. 1913, pp. 8-9.

On a small farm at Wolfram the crops were attacked severely by various caterpillars and insects and the farmer tried a solution of carbide lime (the waste after making acetylene gas) while still fresh, diluted with about 5 times its volume of water and splashed

over the vegetables (he having no spraying apparatus) and obtained excellent results. Cabbages, pumpkins and all other vegetables were freed from pests and none were damaged, with the exception of seedling lettuces, for which he found it advisable to use the solution of half the above strength. He now uses this simple insecticide constantly and is thoroughly satisfied with the results.

Ross (C.). **The Fruit Fly Pest.**—*Queensland Agric. Jl.*, Jan. 1913, pp. 36-37.

The author says that the early months of the growing season are the most important periods for the destruction of fruit flies, and that it is perhaps necessary to remind those who have not already destroyed the remnants of the summer orange crop, that they should immediately do so, either by burying or boiling all unmarketable and infested fruits. The fruit flies do not appear in the Warwick and Stanthorpe districts until the season is well advanced, and this he regards as proof that the fly is not bred there during the winter, but is introduced from the warmer districts.

Spraying is considered to be absolutely useless. The best practical means known for preventing the spread of the pest is to examine all fruit before packing. Deep raking or shallow cultivation between the trees will enable fowls and birds to get at the maggots that have previously entered the ground. The maggot after leaving the fruit, burrows to a slight depth in the soil, and emerges as a full-grown insect in about three weeks. Orchards should be periodically cleaned, preferably soon after rain. Lime, soda, kerosene and caustic top dressings applied separately to the soil surface are all fatal to the grub. Covering the trees with fine meshed netting before the fruit changes colour is a very effective means of protection. Kerosene tins placed here and there in the fruit gardens, as receptacles, will often act as preventives to visitors spreading the fly, as they are apt, after opening a tempting-looking peach and finding it maggoty, to throw it on the ground, thus providing the maggot with a congenial home.

The author complains that the private owners of a few trees are generally the chief offenders in spreading the pest, either through ignorance or carelessness, and abandoned orchards are especially pointed to as prolific breeding grounds.

Jarvis (E.). **Notes on the Bean Fly** (*Agromyza phaseoli*). — *Queensland Agric. Jl.*, Jan. 1913, pp. 124-5.

The author says that attempts to cultivate French beans in Southern Queensland are apt to be disappointing. The crop promises well at the start, but before long the young plants show unmistakeable signs of arrested growth, become weak and sickly, and die. There is no decided external evidence of injury and the growers are at a loss to account for the cause of failure. The

trouble is caused by *Agromyza phaseoli* (the Bean Fly). The method of oviposition is described and the author says that on a young leaf from a Tonga bean he found 91 punctures, only 9 of which however enclosed eggs.

SEYMOUR (G.). **Report on the Experimental Potato-field.**—*Jl. Agric., Victoria*, 10th March 1913, pp. 166-174.

More damage was done during 1911-12 by the potato grub to the mid-season crop than by the blight in 1910-11, in some cases amounting to fully 50 per cent. No satisfactory method has yet been devised for coping with this pest. The use of tarred canvas screens to trap the moth when on the wing and spraying with arsenical preparations are recommended. The latter will probably give the most satisfactory results if commenced in time. In many cases where the crop was dug before the plants dried off, tubers which were apparently sound were put into bags and covered with green tops: when the sap dried out of the latter the grubs forsook them and attacked the tubers in the bags, which are often left in the field for a week or 10 days. The result was that when the potatoes reached the market they were found to be so badly tunnelled by the grub that from 50 to 75 per cent. were unfit for use. Deep planting has been recommended (5½ to 6 inches), but this of itself is not sufficient, as it is the habit of some varieties to form their tubers near the surface. The best protection is probably fairly deep planting and thorough moulding up of the plants. If the moths appear in the fields, this should be done as soon as the tubers are well grown: and to get satisfactory results from moulding the drills should be not less than 30 inches apart. If the tubers are large enough for table use they should be harvested and disposed of as quickly as possible. If intended for seeding, it would be advisable to immerse them in a solution of corrosive sublimate (1½ oz. to 7 gals. of water) for 1½ hours.

COCKAYNE (A. H.). **A New Species of Grass Grub. A Serious Pest of Seedling Forest Trees.** — *Jl. Dept. Agric. Indust., New Zealand*, 1913, pp. 295-298, 1 fig.

The author says that considerable loss is annually sustained in the seedling beds at the State Forestry Nurseries through the roots of young trees being destroyed by the larvae of certain species of "grass grub," and he was of opinion that the pest was *Odontria zealandica*, well known in New Zealand on account of the serious damage done by it to pastures. In the Whakarewarewa State Nursery, during December 1912, it was clearly demonstrable that this insect was not the cause, as full grown larvae were abundant in the large beds on that date. Had the damage been due to *O. zealandica* there would have been very

few larvae present, as normally the majority would have pupated and emerged during the latter part of November. No method of distinguishing the various species of grass grubs in the larval stage has yet been worked out, but specimens of the beetle were forwarded to Major Thomas Broun, who decided that they belonged to a new species and named it *Odontria puncticollis*. The beetles were obtained in the following manner. A portion of one of the large beds, where all the trees had been killed, was selected, measuring 1½ ft. by 6 ft., all the soil to a depth of 9 ins. in this space being put through a sieve; 10 grubs were obtained, most of them at 6 ins. to 9 ins. from the surface. Below this the sub-soil to a depth of 6 ins. was taken out and screened, with the result that 20 fully developed beetles and 11 pupae were obtained. The beetles emerge about the beginning of February, when a large flight was observed, over 100 beetles being collected by hand in a few minutes.

The badly infested plots were deeply ploughed and then top-dressed with "apterite" in August 1912 and well harrowed. Cow peas and soya beans were sown in November 1912, since when no grubs or beetles have been found. It is suggested that one of the best methods of control would be to cover the beds every evening with beetle-proof frames during the short period that the insects are on the wing. The present seed frames employed could be easily adapted for this purpose. Larches were killed over large areas, but it appears that *O. puncticollis* will not damage Corsican pine, and it would seem as if the beetles will not lay eggs in soil occupied by seedlings of this tree. This is somewhat confirmed by the fact that larch trees growing accidentally in the Corsican pine seed-beds are not affected. The author thinks that it might prove advisable to combine the sowing of a certain amount of larch with the Corsican pine, and as the latter tree is extremely aromatic, experiments with deterrent sprays may probably yield good results.

Morstatt (H.). **Die Vertilgung der Erdraupen.** [The destruction of cutworms.]—*Der Pflanzer, Daressalam*, ix, no. 4, April 1913, p. 195.

The method employed in Meru, German E. Africa, for the destruction of cutworms by surrounding the plants (coffee, tobacco) with rings of wood-ashes, is not always feasible. In the case of seedlings it is advisable to use poisoned bait, consisting of a well-mixed paste of 1 kg. of bran or maize meal with 50 gr. of sugar and 20 gr. of Schweinfurt Green. Finely chopped clover or maize leaves, saturated in a solution of 20 gr. Schweinfurt Green and 100 gr. of sugar in 10 litres of water, will do equally well. The bait is distributed in small heaps, and, if possible, covered with banana leaves, which will prevent it from drying up and, at the same time, will attract the caterpillars during the day. Otherwise the caterpillars will only come out during the night and have to

be collected with the aid of lamps. It is well to plough the fields intended for seedlings several times and remove all the weeds, besides setting the bait. The Rhodesian method of covering tobacco-fields before planting with twigs or dry tobacco-stems and destroying the accumulated cutworms by fire is also recommended.

French (C.), Junr. **A New Insect Pest of Roses. The Vine Curculio (Weevil)** *Orthorrhinus klugi*, **Boh.**—*Jl. Agric., Victoria*, 10th April 1913, pp. 240-241, 1 pl.

This insect, the natural food of which is the Wattle (*Acacia*), is known in most parts of Victoria. During recent years it has been proved that these insects forsake their natural food and turn their attention to vines, causing considerable loss to growers, and they have now commenced to attack roses. Specimens of rose stems which were being killed by insects were received in July last and found to be badly infested with the larva of this weevil, and the perfect insects emerged in December, as many as 6 being obtained from a piece of stem 7 inches long. The head of the School of Horticulture at Burnley informed the author that at Diamond Creek in 1909 he saw these insects on the young terminal twigs of Jonathan apples and apricots. The author recommends spraying with coal-tar water made by boiling 1 lb. of coal-tar in 2 gals. of water and, while hot, making up to from 50 to 100 gals. Benzol emulsion, obtainable in Melbourne, of which 1 lb. makes 5 gals. of spray, is said to be effective. All dead or dying acacias near a garden should be destroyed by burning.

Lounsbury (C. P.). **Mally Fruit Fly Remedy. A Demonstration of its Applicability in Towns.**—*Agric. Jl. Union South Africa*, v, no. 4, April 1913, pp. 570-574.

Baiting for the Fruit Fly has become an established practice on some of the largest fruit farms in the Cape Province, and the author thinks that it will also prove useful for gardens in towns. Reports from large orchard owners are satisfactory, but residents of Pretoria reported unfavourably and the author directed tests to be carefully made on late peaches in a much-infested garden in Pretoria, the results being quite satisfactory.

The remedy consists in the application, preferably with a garden syringe, of a small quantity of dilute arsenically poisoned syrup at frequent intervals to those trees which it is designed to protect, at the rate of about one pint to a tree about 10 feet high and 10 feet wide. It should be renewed promptly after any rain and at least once a week or once a fortnight, according to the prevalence of the pest in the neighbourhood. The first application should be made to the earliest susceptible fruits about the

time they are two-thirds developed. The later-maturing fruits should be included in the process as they reach this relative stage, and the syringing should be continued until all the fruit is off.

The remedy acts by fatally poisoning the flies that otherwise would deposit their eggs in the fruit. In places in which the pest is specially prevalent, it is advised that one or more preliminary syringings should be given about October, as a few flies early in the season may become the progenitors of many hundreds later. It is essential to success that the syringing should be carried out thoroughly and persistently throughout the season. The garden in which the test was conducted was a private one, in which the method had been unsuccessfully practised last year. The trees in it included orange, lemon, naartje, apple, pear, peach, nectarine, apricot, quince, plum, persimmon, fig, guava, and loquat, but only a few of each variety, and the different kinds were more or less mixed. A great part of the garden was fenced by a Kei apple hedge, nearly 300 yards in length, the abundant fruit of which becomes infested by the fly. It was considered advisable to restrict the baiting to trees in one part of the garden and make control observations on peach trees growing in another part. The trees chosen as controls were about 150 yards distant. Fifty-seven trees were treated with the following mixture:— 6 lb. of brown sugar, 6 oz. of arsenate of lead paste, and 8 gals. of water. The first dressing was given on the 16th January, when there were few flies; but there were a number of maggots in some still very hard green fruit on the late varieties of peach which the treatment was designed to save. Out of 15 picked for examination, 11 were infested, and every one of 32 found on the ground were in like state. There was much rain during the period of experiment. The final spraying was applied on the 18th Feb. and the last of the fruit was gathered on 24th Feb. Rain fell on 23 of the 33 days between the first dressing and the last, though on 4 or 5 of these days the quantity was not worth considering. Thirteen dressings were applied. After 5th Feb. all windfalls were examined for maggots every third day. On 5th Feb. 25 per cent. were maggotty, and from the 8th to the 24th, 29½ per cent. Of the plucked fruit from the 5th to the 21st 11 per cent. were maggotty and on the 24th 16 per cent. The windfalls from three untreated trees showed respectively 95¾, 95¼, and 98¼ per cent. of maggotty fruit, against an average of 29 per cent. from the treated trees, although the distance between the baited trees and the unbaited ones was only about 150 yards. In the neighbouring gardens it was reported that the early fruit had been practically free of maggots, the mid-season fruit much infested, whilst the entire crop of fruit borne by the single late peach tree present was a complete loss. The author thinks that it is only fair to assume that the fruit of the baited trees would have been a total loss had it not been for the baiting and that therefore, if faithfully carried out according to the directions issued by the Entomological Division, the "Mally Fruit Fly Remedy" is applicable under town conditions even in summer rainfall areas.

Muller (J.). **Arsenate of Lead. Composition of Various Brands sold as Insecticides.**—*Agric. Jl. Union of South Africa*, v, no. 4, April 1913, pp. 583-585.

The author made an examination of eight commercial brands sold as insecticides and sets out their price, their composition and the approximate cost of the arsenate of lead in each, required for use with 25 gallons of water, in order to make Mally's formula of the proper strength.

Lounsbury (C. P.). **Locust Bacterial Disease.**—*Agric. Jl. Union of South Africa*, v, no. 4, April 1913, pp. 607-611.

Under the author's directions experiments were made with *Coccobacillus acridiorum*, d'Hérelle, procured from the Pasteur Institute. Migratory locusts are practically absent from South Africa at present, but great complaints have been made for several seasons of damage done by *Zonocerus elegans*, especially at Daspoort Gardens, near Pretoria, where the experiments were made. The eggs hatched about the 10th October, but on account of the small size of the young insects and for other reasons work with the disease was not started until 1st Jan. The method was briefly as follows:—The organism was cultivated in peptonised bouillon and after 48 hours a series of insects were inoculated by means of an hypodermic syringe. The second series was inoculated with the excreta squeezed from the abdomen of individuals of the first series when they were dying, the process being carried on from series to series for about 12 times, until the disease was sufficiently virulent to kill the insects in about 8 to 10 hours after inoculation. A detailed account is given of the results of laboratory experiments. On the 3rd and 4th February six patches of land thickly infested with the grasshopper were infected with the culture, and on the 24th March a few sickly specimens were found which proved on microscopical examination to be attacked by the disease. The general result was failure, which the author attributes to the fact that the insects had become fully matured and had almost ceased to feed at the time of infection, and that heavy rain fell from time to time which probably washed the infection from the vegetation. He thinks that the disease at best can only be used as a supplementary measure in dealing with an invasion of locusts under the conditions which prevail in South Africa, and under ordinary circumstances arsenical poison may be expected to be equally efficient and cheaper in use, especially as the employment of d'Hérelle's disease will not be always practicable. The author points out that the method of preparing the virus practically necessitates the provision of stations for its preparation at a number of centres about the country, and that it is very doubtful whether reliable virus would be turned out at a station unless the man in charge were something of a bacteriologist. On the whole, he does not think that the use of arsenical syrup will be abandoned in favour of d'Hérelle's disease as a principal means of dealing with the locust pest.

South (F. W.). **Work connected with Insect and Fungus Pests and their Control.**—*Report Agric. Dept. St. Vincent,* 1911-1912, Barbados, 1913, pp. 7-12.

Cacao diseases.—The common fungus disease of cacao pods known as "scabby pod"—characterised by a scabby appearance of nearly ripe pods, dying back of the young twigs, and a red discoloration of the inner bark visible on cutting into the lower part of the stem, and loss of leaves—is often accompanied by very large numbers of thrips (*Heliothrips rubrocincta*). In Grenada it is believed that the presence of these insects in large numbers is a sure indication of adverse soil, cultural or climatic conditions; similarly in Trinidad, though Urich draws attention to this insect as a direct pest. Where thrips is present in St. Vincent, attention should immediately be paid to the soil, which should contain sufficient plant food and humus, and be in a good state of tilth and drainage. In places where thrips are very prevalent it is advisable to spray with resin wash, or with Bordeaux mixture, especially in damp situations, to check lichens and fungus at the same time. At Mt. William estate the cacao cultivation has greatly improved owing to the cessation of the attacks of thrips. The rapid diminution of the latter cannot be satisfactorily accounted for, unless there was a natural enemy at work.

The black scale pest of cotton.—During the past season great damage was done to cotton in the Leeward District of St. Vincent by the black scale (*Saissetia nigra*), and it is spreading rapidly over the island, several estates in the Windward district having been affected. Large crop losses are to be feared, unless measures are taken to check the pest, which unfortunately has but few natural enemies locally. Once the scale enters a field it spreads so rapidly that a good crop cannot be produced, the plants "drying up" prematurely and looking as if they had been "blasted." It is essential to pull up and burn all the cotton stalks as soon as possible after the crop is picked. Unfortunately the growers do not realise the amount of damage done annually by the black scale. As the scale occurs on weeds and bush along the fields and on many plants (sorrel, hibiscus, sugar- and custard-apples, almond, wild figs, angelin, &c.), precautions should be taken either to remove them or to trim away leaves and small branches before the planting season begins. The most critical period of the year for the occurrence of the blight is during the growing season, *i.e.*, June to December.

Reitter (E.). **Bestimmungstabelle der Borkenkäfer (Scolytidae) aus Europa und den angrenzenden Ländern.** [Identification Tables of the Scolytidae of Europe and adjacent countries.] —*Wiener Entomologische Zeitung,* xxxii, Beiheft, 15th May 1913, pp. 1-116.

A useful key to more than 360 species of Scolytidae, with notes on their habitats. The preface (pp. 3-10) contains a discussion of the basis of classification and a criticism of the system elaborated by Prof. Nüsslin in his "Leitfaden der Forstinsektenkunde."

Nüsslin (Dr. Otto). **Leitfaden der Forstinsektenkunde.** [A Textbook of Forest Entomology.]—2nd improved and enlarged edition, 522 pp., 432 figs., 7 portraits. Paul Parey, Berlin, 1913. Price 12 marks.

Whilst following strictly scientific lines, the author's chief endeavour has been to keep the practical object of the work always in view, namely, the instruction of students of Forestry in such entomology as would be really useful to them, rather than the production of a general treatise on entomology with special reference to those groups of insects whose life-history and operations come within the purview of the forester. He accordingly contents himself with a chapter of 32 pages only on the internal structure and biology of insects: 13 pages more are devoted to a statement of the general relations of insects to forestry, and the remainder of the work is entirely occupied by a detailed examination of those orders, genera and species with which the forester may have to deal in the execution of his higher duties, namely, the protection of the living trees entrusted to his care from the attacks of insect enemies, a full knowledge of the habits and life-history of which is often of greater importance than the study of minute systematic detail. The author's method is to give a concise description of the distinguishing features of each genus in a family and then to deal more in detail with those genera and species with which it is important that the forest entomologist should be thoroughly acquainted; a brief outline of the biology of the family and its general relation to forestry: methods of combating its attacks and an account of the damage done by the insects to certain species of trees. An appendix contains an outline of collecting excursions for students attending lectures at the forestry school in Karlsruhe. The book is well and profusely illustrated throughout and the author expresses his great obligation to Drs. Nitsche, Henschel, and Eckstein for the bulk of the illustrations, a large number of which however are from original drawings and photographs prepared expressly for the work. How far the author's classification of the Scolytidae on a phylogenetic basis, with reference to their internal as well as their external morphology, is a departure from the governing principle of the book, is perhaps a matter for criticism, but that the work is a thoroughly practical and well-arranged textbook of the subject can hardly be gainsaid.

Comte (A.). **Chenilles nuisibles aux plantes basses.** [Caterpillars injurious to herbaceous plants.]—*Rev. Agric. et Vitic. de l'Agric. du Nord, Algiers*, ii, no. 4, 1913, pp. 33-34, 1 fig.

The author reports enormous numbers of caterpillars of *Thaumetopoea* (*Cnethocampa*) *herculeana* as marching over the country near Tunis and devouring all manner of small plants whether wild or cultivated, cereals, forage, and kitchen garden crops. He recommends the burning of the nests as soon as they are discovered and the destruction of all weeds during the winter.

Note sur la nécessité de l'emploi des substances vénéneuses et notamment de l'arséniate de plomb en agriculture. [Note on the necessity for the use of poisonous substances and especially of lead arsenate in agriculture.]—*Bull. de l'Office des Renseignements Agricoles du Ministère de l'Agriculture*, Paris, Feb. 1913.

This circular is largely occupied with the difficulties which arise in practice from the poisonous nature of many substances of great value to agriculturists as insecticides, and contains certain regulations as to their handling and the marking of cases, barrels, &c., which have contained them. Fully recognising the dangers involved in their use, the Commission appointed to enquire into these matters expresses the opinion that any legislation which would seriously interfere with the proper use of these poisonous substances and particularly of arsenate of lead as an insecticide, would spell disaster to a large body of French cultivators, as it is the only radically efficacious insecticide against a very large number of formidable insect pests. It is said that no case of accident, either fatal or otherwise, attributable to arsenate of lead is on record. The cases of poisoning which have been recorded have been found to be due either to white arsenic or soluble arsenates. In September 1911 a large number of chemical analyses were made of grapes, wines, piquettes,* and vineyard residues from vineyards in which the vines had been treated with arsenate of lead. The summer was remarkably dry and the arsenate had not been washed off by rain, and the report showed that in spite of these extraordinarily unfavourable conditions, no arsenic or lead was found in any of these products. The only cases in which lead was found were those in which the grapes, in defiance of the advice given by the agricultural authorities, had been treated with arsenate some time after the fruit was formed, a method which is formally interdicted by the regulations now under consideration. Whilst fully recognising the danger attaching to the use of arsenical compounds in agriculture, the authorities believe that with proper precautions and regulations the danger can be so minimised as to be almost non-existent.

Johannsen (O. A.). **Two Spruce Leaf-Miners.**—*Maine Agric. Expt. Station, Orono*, Bull. no. 210, Feb. 1913, pp. 32-36, 1 fig.

The larvae of two leaf-mining moths, *Recurvaria piceaella*, Kearfott, and *Epinotia piceafoliana*, Kearfott, have been collected on Norway spruces on the Campus of the University of Maine, Orono, and the author has reared three hymenopterous parasites from the latter, *Porizon* sp., *Clinocentrus* sp., and *Microdus* sp.

* [Piquette is a drink made by extracting the wine press residue with water and allowing it to ferment.]

JOHANNSEN, (O. A.). **Spruce Bud-worm (*Tortrix fumiferana*, Clemens).**—*Maine Agric. Expt. Station, Orono*, Bull. no. 210, Feb. 1913, pp. 1-31, 3 pls., 2 figs.

The author says that for the past 2 or 3 years the spruce bud-worm has proved the most serious pest of the spruces in Maine. It appears to be a native of the country. The species was first described there in 1865 and accounts are in existence of insect ravages believed to be those of the spruce bud-worm as far back as 1807. It is at present widely distributed over Eastern Canada, northern New England, New York, Vancouver and Manitoba. The author gives a brief account of the history of the pest from the earliest known observations. For a period of 25 years previous to 1908 there was no recurrence of any serious injury caused by this insect. It was recorded in Manitoba in 1907, and in July 1909 its numbers in western New York were so great that the females laid their eggs even upon window-sills and casements. In 1910 the pest spread over a wide territory covering south-eastern Canada, east of Lake Huron, southward to the Gulf of St. Lawrence, eastward to Nova Scotia, all northern New England and northern New York. In Philadelphia, in 1911, the moths were so numerous as to interfere with the street-car traffic, and in 1912 they were reported in Connecticut as having never been so abundant. The first intimation of the presence of the pest is in late spring or early summer, when the trees look as if a light fire had passed through them. The trees which are liable to attack are, firs, spruce, and larch (or tamarack, often erroneously called juniper in Maine). Firs are said to be most susceptible and in woods where white, red, and black spruce occur, the white spruce is chiefly affected, and the Norway spruce is said to be specially susceptible. The damage to the trees is most conspicuous about the time when the larva is full grown, that is about the middle of June, in the vicinity of Orono. The caterpillars begin feeding on the young growth in spring. They pupate about the middle of June, and in a week or 10 days the moths emerge and are to be seen on the wing from the middle of June until near the end of July. The eggs hatch in a week or 10 days, and near Orono it was observed that by July 27th nearly all the egg-masses examined were empty. It is said that the larvae feed on the terminal shoots of the branches for a short time before hibernating and that they pass the winter as a very small caterpillar in a little shelter constructed near a bud. Extended search in the vicinity of Orono and other places by the writer and other experienced observers failed to reveal a trace of the young larvae. As it is certain that they do hibernate, their disappearance this season in these localities seemed almost inexplicable. The only reasonable explanation which the author says can be offered is that the small caterpillars were eaten by spiders which were very abundant upon the spruces and which were frequently observed feeding upon them. This pest is controlled naturally by birds, amongst them the purple martin, which was once very common in Maine, but is now decreasing in numbers. Spiders are so active in the destruction of the larvae that the author made special observations on their capacity in

this direction, and was able to satisfy himself that two spiders were quite capable of exterminating several hundred newly hatched larvae which emerged from 12 or more egg-masses upon the branch used for observations. Unfortunately the spiders were lost, but they apparently belonged to the family Theridiidae. The spiders collected from spruce trees on which egg-masses of the bud-moth were abundant were determined by Mr. J. H. Emmerton as *Theridion spirale*, *T. differens*, *Linyphia phrygiana*, and *Dictyna volupis*, and the author is of opinion that the extraordinarily small number of young caterpillars found, in comparison with the very large number of egg-masses, can be explained by the action of these spiders. Of insect parasites, several Hymenoptera have been reared, but only two species of Diptera, *Exorista vulgaris*, Fallén, and a new species of Tachinid, *Winthemia fumiferanae* (described in the Canadian Entomologist, xliv, pp. 2-3). The two species of Hymenoptera which were reared were *Pimpla ontario*, Cresson (Trans. Amer. Ent. Soc., iii, p. 146), and *Pimpla conquisitor*, Say.

Dr. Gordon Hewitt has reared the following parasites of the spruce bud-worm, *Apanteles fumiferanae*, *Meteorus trachynotus*, *Conoblasta fumiferanae*, *Phygadeuon* (*Dirophanes*) *plesius*, *Epiurus innominatus*, and *Mesochorus diversicolor*, of which the first four are from the province of Quebec, and the last two from British Columbia. *Nasonia tortricis*, Brues, is another Canadian species parasitic on the spruce bud-worm. The author says that so far as remedial measures are concerned, it would be quite impracticable in timber-lands to do more than aid the spread of the beneficial parasites, but that in limited areas or for the protection of ornamental trees or of young trees in a plantation, the use of arsenical sprays would keep the pest under control. This is rendered easier by the fact that the insect is a native and is subject to attack by indigenous parasites, and the author thinks that its past history justifies the hope that it will succumb to its natural enemies within a very few years. Details are given of the results of spraying experiments and their cost. The spray used was arsenate of lead 5 or 6 lb., mixed with 100 gals. of water. The cost per tree sprayed by machinery varied from 30·7 cents to 40·6 cents in the grounds of the station, but those trees which were far away from a water supply and not easy to reach, averaged 88 cents. A short bibliography concludes the article.

Johannsen (O. A.). **The Potato Flea Beetle.**—*Maine Agric. Expt. Station, Orono*, Bull. no. 211, March 1913, 4 figs., 1 pl., pp. 37-56.

The author says that next to the Colorado beetle this is the most destructive of the annually recurrent insects on the foliage of the potato in Maine. The insect riddles the leaf with minute holes, and in the case of one unsprayed field in Orono last year the plants were entirely killed before July 10th. The damage actually done by the insect is not however a measure of the full extent of injury to the plant, because it has been observed and is generally acknowledged that fungus disease follows rapidly upon its attack, and it is possible also that the insects assist in carrying

such diseases from plant to plant. Although the adult has long been known, it is only within the last few years that it has been discovered that the larvae live in the ground, feeding on the roots and tubers of the potato and perhaps on related plants. The distribution of the pest is very wide and is mentioned in the publications of more than half the Agricultural Experiment Stations of the United States. The hibernating adults emerge from their hiding-places under leaves and rubbish during April and May in the State of Maine, usually in the latter month, and are to be found upon plantain and other weeds as well as upon the foliage of wild cherry, apple, maple, and other trees, on which they apparently feed but little, if at all, for the leaves are not punctured, but early in June, in the vicinity of Orono, when the young tomato plants are set out, the beetles swarm on to them and do great damage. Mating takes place in the last week in June and the first eggs are found about the same time, and none later than the middle of July. In laboratory experiments potato plants were charged with flea-beetles on July 3rd; on July 30th full-grown larvae and a few pupae were found among the roots, the larvae mining in the seed potato. The pupae as well as some of the larvae were found free in the earth among the roots. During August and up to the end of the first week in September larvae and pupae were to be found in the ground among the young tubers, but after that date they had all disappeared. The first frost of September marks the disappearance of the beetles. The author gives a list of host plants and remarks that the insect prefers the members of the natural order Solanaceae, especially the wonder-berry (*S. nigrum*, var.). Experiments were also made in the laboratory with a large number of plants with a view to determining what the insect would and would not eat. Bean, sunflower and lettuce were readily consumed, but the insects refused to eat, amongst others, raspberry, turnip, cabbage, red clover, carrot, and horse-chestnut leaves. With regard to these experiments the author remarks that they must not be regarded as conclusive because the leaves used were in most cases fully grown and that the insect has an obvious preference for very young and tender leaves. No parasites were obtained by the author, although Braconid parasites have been recorded by Forbes and Chittenden. It has frequently been said that the flea-beetle cannot be poisoned and the author, whilst remarking that this of course is not true, says that it is well known that potato fields sprayed in the usual way against the Colorado beetle are not exempt from attack by the flea-beetle, which carefully avoids the poisoned part of the leaf and contrives to obtain what it requires on the underside where there is no poison. He suggests that it is very desirable to devise some poison mixture which would prove attractive to the insect. Experiments were made on a small field at Orono with arsenical sprays sweetened with syrup, but the conditions of the experiments were not very satisfactory, although the author is inclined to the belief that sweetened arsenical sprays would be of some value. Bordeaux mixture is an excellent repellent. The article concludes with a lengthy bibliography and a long list by Miss E. M. Patch of insects recorded on potato.

Truelle (A.). **Peut-on empêcher la ponte des Cécidomyes noires sur les poiriers?** [Is it possible to prevent the Black Cecidomyia from laying eggs on pear trees?]—*La Vie Agricole,* ii, 22nd March 1913, pp. 448-449.

The author says that in those districts in which pears are largely grown the ravages of the larvae of *Cecidomyia pirivora* or *nigra* are often very serious. The female lays 15 to 20 eggs in April on the flower-buds just before they open and the larvae as soon as hatched penetrate into the embryo ovary of the pear causing hypertrophy and distortion. The pears lose their proper form and are known to the growers as "calabash pears." Frequently in the beginning of June the hopes of a good harvest are entirely destroyed by the fall of large numbers of these damaged fruits. There are but few methods of control and all have for their object the destruction of the larvae contained in the young pear and the pupae which are wintering in the soil. The first can only be dealt with by collecting and burning all affected fruits, and it is found to be an excellent plan to allow pigs and poultry to run in the orchards. With regard to the pupae in the soil, the author says that the method, practised in the United States, Canada, and England, of spreading kainit over the whole surface of the soil shaded by the trees towards the end of summer, is now in use in France. Quite recently it has been suggested to use a spray made as follows:—10 per cent. nicotine solution 1 litre, methylated spirits (90 per cent.) 1½ litres, soft soap 200 grms., and rain-water to make one hectolitre, the whole to be thoroughly mixed and sprayed over the flowers just after they open. The author points out that, with the exception of the last-named method, these remedies are only applicable after the damage has been done. He further draws attention to the work done by Dr. G. Lüstner, Director of the Station of Vegetable Pathology at Geisenheim on the Rhine, which was prompted by the great damage done by this insect to pear orchards in Germany, with a view to determining whether anything could be done to prevent the insect from laying its eggs upon the flower-buds. The general plan of these experiments was the use of odorous substances and certain poisons sprayed upon the young buds: but Dr. Lüstner arrived at no definite conclusion as to the results, because in the orchard of the experiment station the attack of the fly was very much less than in the previous year and further experiments would be necessary in order to decide as to the utility or otherwise of any of the preparations used. At all events they did no damage to the flowers.

Watson (J. R.). **Melon Aphis.**—*Univ. Florida Agric. Expt. Sta.,* Press Bull. no. 206, 29th March 1913, 2 pp.

This plant louse is commonly called the Melon Aphis, but in Florida is frequently called the Hessian Fly, although entirely different from the true Hessian Fly. It lives on the undersides of the leaves. The outbreak is easily overlooked in the early stages, and the presence of the pest is not noticed until the leaves begin

to curl and die to a serious extent. The author says that there are four effective measures for keeping the pest in check:—spraying, fumigation, dusting and clean culture. For the ordinary grower he recommends spraying with soap and a decoction of tobacco, which should be done immediately the first sign of attack appears. He gives the following as a good formula:—Dissolve 1½ lb. of soap in ½ gal. of water, add four-fifths of a pint of "Black Leaf 2 and 2-3," boil for five minutes and dilute to 5 gals. He says that tobacco extracts on the market vary in strength, but most of them will require to be used in a dilution of about 50 volumes of water in order to kill this aphid, which is more resistant than most others. "Black Leaf 40" is a strong extract of nicotine sulphate, and one part of this in 1800 of the spray will suffice to kill. With the home-made decoction use about one part to five of water, or one gallon in the above formula instead of the "Black Leaf." Kerosene emulsion and whale oil soap are satisfactory remedies against aphids, but for cucurbitaceous plants it is difficult to use it of sufficient strength without causing damage. There is no danger from the use of soap tobacco spray. The author recommends a nozzle of the Vermorel type with an elbow, so that the spray can be effectively applied to the undersides of the leaves. He describes methods of fumigation with prepared tobacco paper, hydrocyanic acid and carbon bisulphide, and recommends large growers to prepare about 10 fumigation frames 1 ft. by 4 ft. by 6 ft. covered with muslin cloth which has been soaked in linseed oil. The cloth should hang below the frame so that earth can be thrown on its edges to make the frame airtight. Dusting with fine tobacco dust is often effective in preventing an outbreak, but it is much less effective than spraying when the pest has made some headway. Clean culture is very important, because the aphids feed on a large number of common weeds and live through the winter on them. The ground on which a cotton crop has been planted should not be laid down to melons the year following. It is suggested that on ground which is intended to be planted with melons or cucumbers, a little rape, kale, or mustard should be grown during the winter as a trap crop. The cabbage aphis is attracted to this, and also many Syrphid flies which destroy them in large numbers.

Korolkov (D. M.). НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ САДЫ [Insects injurious to gardens].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912–13, pp. 1–25.

The entomological researches which led to the appearance of this report were initiated by the Zemstvo of Moscow in the year 1909, and this is the fourth report of the kind which has been issued.

The following insects are recorded as having done more or less injury to fruit trees in the Government of Moscow during the year 1912:—*Byturus tomentosus*, F., *Incurvaria rubiella*,

Bjerk., *Carpocapsa pomonella*, L., *Nematus ribesii*, Scop. (*ventricosus*, Kl.), *Macrophya punctum-album* L., *Malacosoma neustria*, L., *Aporia crataegi*, L., *Hyponomeuta malinellus*, Z., *Leucoma salicis*, L., and *Psylla mali*, Först. The greater part of this report is devoted to the first-named insect, *Byturus tomentosus*, F. In the spring of the year under report exit of adults of this insect from the soil was considerably delayed in comparison with the preceding year, single specimens having been found here and there on raspberry, as well as on apple, acacia, lilac and service-trees, on and about the 24th May, while their appearance *en masse* did not take place till much later. This delay was caused by the lower spring temperature. The insects mostly hibernate in the larval stage, pupating about the middle of April, and the adults normally emerge towards the end of that month. At the time of the budding of the raspberry only the beetles which had wintered in the imago stage came out of the earth and the great mass appeared later, when the raspberry had already opened its buds and produced blossoms, to which the insects could not do so much harm. The laying of eggs was also delayed and when this took place the stamens and styles in the first blossoms had already faded and the ovaries were set, so that the beetles did not lay their eggs in these blossoms and the earlier raspberries were free from larvae, but the later fruit was very badly infested because eggs had been laid on the blossoms by two generations of beetles, *viz.*, those which had wintered as adults and those produced from the larvae in the early spring. The hibernating larvae seldom go deeper than 5-10 cm. in very friable soil, but some of them remain at a depth of only 2-3 cm.

Another unfavourable feature of the year for *B. tomentosus* was the feeble blossoming of cherry and plum trees, which caused the insect to starve for a considerable time. In the opinion of the author it is very likely that this scarcity of blossoms caused the beetle this year to visit plants on which it has seldom or never been observed previously, such as, *Syringa vulgaris*, L., *Ribes rubrum*, L., *R. grossularia*, L., *Amelanchier vulgaris*, Mnch., and *Taraxacum officinale*, Wigg.

The author describes experiments with different insecticides which he carried out in order to discover their effect on the larvae and adults of *B. tomentosus*, as well as on the roots of the raspberry bushes. The insecticides used were creoline, carbolineum ("shachta"), carbolic acid emulsion, oil (naphtha, black residue) emulsion, and carbon bisulphide, which, mixed with water, were poured on to the soil under different raspberry bushes. Artificial manures, such as superphosphate, potash salts, etc., were also distributed over the soil under the bushes in order to test their effect as insecticides. The results of all these experiments are summarised as follows:—(1) The autumn experiments were less effective, probably because the cold weather had considerably diminished all the life-processes of the larva and imago; (2) the manures did not affect in any way the vitality of the insects; (3) oil emulsions had also no effect; (4) a 2 per cent. carbolic emulsion partially destroyed the insects, when applied in quan-

tities of 0·7 gal. under each bush; (5) carbon bisulphide, which was injected into the earth by means of Platz's injector, had a very slight effect and only when injected at short distances from the bushes; (6) the best results were obtained by carbolineum and creoline when used in a 2 per cent. solution and in a quantity sufficient to penetrate to a depth of 4-7 inches; weaker solutions had less effect, while a 3 per cent. solution killed all the insects it reached.

The author also describes experiments for controlling the beetle during the period when it attacks the raspberry blossoms, by sprinkling on them a solution of Paris green in ammonia and of a foul-smelling preparation of calcic sulphide recommended by E. I. Zlobin (the composition of which is shortly to be published). The first solution burns the leaves of the plants; while the second undoubtedly keeps away the beetle so long as the smell lasts and does not in any way injure the plants, but repeated sprinklings are necessary.

In the author's opinion the great bulk of the *B. tomentosus* were developed from larvae which found their way to the bushes from the unpicked fruits. A great number of larvae get back to the earth from the picked fruits, when these are left in baskets on the plots of the peasants over-night. As the result of the above observations he recommends, as the best means of fighting this insect, the timely picking of the ripe raspberries, whether good or damaged, and the destruction of the larvae which escape from the picked fruits in the baskets. Such a method would be very effective and can be better afforded by the peasants than the use of different insecticides, which are relatively very costly, and the nature and effect of which has not yet been fully investigated.

Incurvaria rubiella, Bjerk. This insect has done more damage this year than in 1911 and especially in the gardens of the village of Zaritzin. The larvae emerge from the earth in which they have passed the winter as soon as the weather begins to be warm (on the 14th May of the year under report) and penetrate into the buds of the raspberries. In most cases these buds never open their leaves, and usually it is the best buds which are damaged. The author never found in one bud more than one larva. In the first period the larvae feed on the buds and do not penetrate into the woody tissue of the stem. It is therefore very easy to pick off the buds with worm-holes and destroy them. The larvae grow very quickly and attain their full development in about a week. They then eat through the buds and pass into the stem; so that at this time by removing an attacked bud it is no longer possible to remove the larva with it, as only the hinder part of the body projects from the stem. The period of pupation in 1912 was from the 2nd to 7th June, and flight took place in the middle of June, the time of blossoming of the raspberry. While the larvae are still in the earth it is possible to eradicate them with carbolic washes or a solution of carbolineum. The author does not possess direct evidence of the death of the larvae from these insecticides, but some experiments showed that there were no larvae of this insect on raspberry bushes around

which the insecticides had been used, although the neighbouring bushes had many damaged buds with larvae in them.

Carpocapsa pomonella, L.—The caterpillars of this insect have been found in several localities in the province in the apples on the trees and also in the fallen fruits. The larvae mature from the beginning to the end of August, after which they usually leave the fruit. The author recommends this as the best time for capturing these insects by means of sticky bands of straw, hemp or rags. He describes his experiments with folded belts which had been put on a tree on the 26th August and removed on the 10th November. From one belt the author took 37 larvae of *C. pomonella*, which had made for themselves cocoons of fragments of paper in which they would have passed the winter; 11 specimens of *Coccinella bipunctata*, which are useful insects, so that the burning of the belts would cause some loss in this respect; and about 42 specimens of *Anthonomus pomorum*.

Nematus ribesii, Scop. (*ventricosus*, Klug).—The larvae of this saw-fly did considerable injury to the red currant bushes in the village of Chocklowka, but the neighbouring black currant bushes were not touched by them. The larvae differ very much in the rate of their development. The pupation of the first generation took place from the end of June to the middle of July on the surface of the earth, generally near the stems of the currant bushes.

Macrophya punctum-album, L.—The larvae of this insect did considerable damage to the ash trees in Moscow, in the Alexander Garden (near the Kremlin), the leaves being skeletonised. Their numbers were enormous, so that the trunks of the trees appeared quite green from the descending larvae. The authorities ordered them to be swept into heaps and destroyed; but although the majority of them were killed in this way and quantities died from starvation, a large number got safely into the earth and pupated in the second half of June, in which stage they wintered. The author recommends that next year the appearance of the insect should be watched for and that it should be attacked by poisoning the food of the young larvae.

Malacosoma neustria, L.—This voracious insect has been noticed during the last two years on the poplar trees of Moscow and its environs. Numbers of the eggs were parasitised by *Telenomus terebrans*, Ratz. The larvae have also been found on apple trees and raspberry bushes and on various other trees in the woods round Moscow. In the opinion of the author the harm done by this insect to the fruit trees is not important, because of the destruction of its eggs by the parasite.

Aporia crataegi, L.—The caterpillars of this species pass the winter in small nests, consisting of dried leaves drawn together by a web. Such nests are found during the winter and early spring on apple trees and also on cherry trees; they should be collected and burnt. The caterpillars emerge from the nests in the first half (1911) or the latter half (1912) of May. They grow very quickly and during their period of growth destroy a great number of leaves. The author also found these caterpillars on the leaves of sorb apples. Many caterpillars were found to have been infested by a parasite, *Apanteles glomeratus*, L.

Hyponomeuta malinellus, Z., was found in quantity during the summer of 1912 on apple trees near Moscow. The injury to the trees was noticed chiefly in the second half of June, although the number of the insects was less than in the previous year.

Leucoma salicis, L.—The injury caused by this insect was considerably less during the year under report than previously, chiefly because of the development of its parasites. In November 1911 some of the sticky belts on the poplars had been taken down, underneath which the larvae of this insect had spun small webs; being thus exposed to the cold they soon perished. On an average, 1,000 larvae were found under each belt. Under the belts left till the spring large numbers of dead larvae were also found.

Psylla mali, Först.—The author describes the result of experiments on spraying the larvae of this insect with a solution of about 1 lb. of soft soap in 3 gallons of water. Owing to the fact that the spraying took place at a time when the larvae had already entered the opening buds of the apple trees the insecticide did not reach them all, but was otherwise very effective. This insecticide caused some burning of the young leaves, but these recovered later and were merely slightly deformed.

A. D. Baranow states that the egg-stage lasts through the winter and that the eggs hatch out in the end of April or middle of May; the yellowish larvae then penetrate into the buds causing them to shrink and wither. The adults appear at the end of May. Pairing takes place in June, and in August eggs are laid in the folds of the young shoots. These eggs are of an orange colour and are so small as to be hardly noticeable. As insecticides against this insect the author recommends:—(1) a solution of $\frac{1}{5}$ lb. of soft soap, 1 lb. methylated alcohol, $\frac{3}{5}$ lb. of tobacco extract and 3 gals. of water; and (2) a decoction of quassia with soft soap:—Boil 3 lb. of quassia chips in water for two hours and strain, make up to 22 gallons with water and add $1\frac{1}{2}$ lb. of soft soap. The author has tried spraying the eggs with a mixture of 1 lb. of green copperas, 2 lb. of rye flour and about 3 gallons of water. The rye flour is boiled in water, the copperas dissolved separately and then mixed. After two sprayings with this solution the eggs turned black and were killed.

Baranow cites the following notes by V. F. Boldirew on *Anthocoris nemorum*, L.:—On the 1st May 1911, when the temperature was 17° R.-18° R. (41° F.) a small pitch-black bug was observed wandering about among the heaps of eggs of *Psylla mali* on the bark of an apple-tree, stopping here and there on a heap. The insect carefully felt the eggs with its proboscis and antennae till it found a fresh full egg, of which it them proceeded to suck out the contents. One insect was observed to suck out the contents of 4 eggs in 4 to 5 minutes. Four similar insects taken at the same time were determined by V. F. Oshanin as being *Anthocoris nemorum*, L.

[In the original the dates are given in Old Style, but they have been converted in the abstract.—Ed.]

LEFTEJEW (V. A.). НАСѢКОМЫЯ, ПОВРЕЖДАЮЩІЯ ОГОРОДЫ [Insects injurious to kitchen gardens].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи. [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912–13, pp. 27–82.

This report deals almost exclusively with *Phyllotreta nemorum*, L., a flea-beetle which does great damage to many Cruciferous plants of economic importance. The author describes all the species of the genus *Phyllotreta* which he found on cultivated plants in kitchen gardens, viz., *P. nemorum*, L., *P. sinuata*, Steph., *P. aterrima*, Schr. (*atra*, F.), *P. undulata*, Kutsch., *P. armoraciae*, Koch, *P. cruciferae*, Goeze, and *Haltica oleracea*. Of all these insects only the first three occur in any considerable numbers and cause practically all the injury. The other species are not so numerous and sometimes only isolated individuals are to be found. With regard to *Haltica oleracea*, the author disputes the statement that this insect is injurious to cabbage, and in his opinion (and in this he is supported by A. A. Silantjew) this supposition has arisen out of the confusion of this insect with a leaf-eating species of the genus *Phaedon*. He has never seen the larva of *H. oleracea* on cultivated Cruciferae, although individual adults were not infrequently found.

The author has investigated the biology of *P. nemorum* and does not agree with those observers who state that the hibernating place of this insect is in the cabbage-stalks which are left standing. He examined 40 stalks of *Brassica oleracea* and found on them a quantity of small Thysanura, two specimens of *Baris chloris*, four specimens of *Longitarsus*, some dipterous larvae and only one specimen of *P. sinuata*. He also investigated, early in March, samples of soil taken from underneath the stalks and in other parts of the garden and found only single individuals of *Phyllotreta*. Examination of the hot-beds gave the same results and, allowing that the wintering of these insects may take place to some extent in the earth, he found that this could not be the case with the majority. At the end of his investigations, in August, the author came to the conclusion, confirmed by facts, that they pass the winter under the cover of the Cruciferous weeds on which they pass their last period of summer life. These plants, lying on the earth after withering, form a warm cover for the hibernating insects.

The author noticed the first beetles in the hot-beds on the 24th April, after which date their number gradually increased, and on the 2nd May the damage done by them to the plants could be clearly observed. Outside the hot-beds he found the first specimens of *P. nemorum* on the 6th May, on *Thaspium arvense*. On the 9th May they had devoured quantities of Cruciferous weeds as well as the cabbage seedlings in the beds. Further investigations led the author to divide the whole summer life of the insects into three cycles as follows:—(1) Leaving their wintering places as soon as the earth thaws and the first green appears

in the gardens, *P. nemorum* being in great need of food immediately attacks and feeds on the Cruciferous weeds which are the only ones to be found at this time of year. They eat the leaves, their petioles, the stalks and the blossoms. The plants attacked at this period are *Thaspium arvense, Capsella bursa pastoris, Bunias orientalis,* and *Draba verna.* This brings the author to the question of the possible use of trap seedlings, by which is understood the sowing of certain plants on special plots in the gardens before the actual appearance of the insects, so that at the time of their appearance they should find no other food and be compelled to concentrate on these plants; an opportunity would be thus afforded for collecting and destroying them. The author describes experiments made to this end, and in his opinion this method of fighting the pest must be conducted very carefully and requires a full knowledge of the bionomics of the particular insect, as otherwise should the exact time for capturing the pest be missed, the seedlings will only have served the purpose of helping its growth, with the result that in a few days it will pass over to the cultivated plants. (2) When the leaves of the Cruciferous weeds have become more coarse the insects leave these plants and go over to the cultivated Cruciferae which have just then come out and afford them more tender food. The insects eat the leaves (the author seldom noticed damage to the petioles), devouring first the thin epidermis, then gnawing through the leaf and afterwards gnawing round the edges of the hole so formed. (3) In August, when the leaves of the cultivated plants, especially of the cabbage, get more coarse and cannot be easily gnawed by the insects, they return again to the weed Cruciferae, which at this time have again put out fresh leaves, and on these they remain till the end of their summer life, afterwards passing the winter underneath the withered remains of these plants. Besides the plants mentioned above, *P. nemorum* was found more or less frequently at a later period on the following, all of which belong to the family Cruciferae:—*Laphanus sativum, Camalina dentata, Erysimum charanthoides, Barbarea vulgaris, Brassica campestris, B. olifera, B. vapifera, B. esculenta,* and *Bunias orientalis.* Investigations on the time the insects can live without any food whatever proved that under normal conditions of temperature and moisture they cannot live longer than about 10 days. Shut up in a glass vessel without earth they began to die on the 3rd day, and in 7 days practically all were dead.

The author describes fully his experiments to determine the amount of food consumed daily by each insect, which was estimated at 14 to 15 sq. mm. of a cabbage leaf. Although this may seem a very small amount, the number of insects attacking each plant has to be taken into consideration. According to observations made by the author near the village of Zaritzin, where the insects destroyed the whole of the cabbage seedlings in one day, no less than 73 to 174 beetles occurred on each plant. They are most active on bright, sunny days, whereas in rainy weather they often leave the plants entirely. They begin feeding in the morning after the dew has gone, at first very slowly, and they do not then jump; the greatest activity in eating and jumping is

displayed between the hours 11 to 1 p.m. and 4 to 5 p.m.; after 7 p.m. they move very little.

The first eggs were laid on 7th June, on the leaves of radish, and from this date the number of eggs found increased daily, it being estimated that *P. nemorum* requires more than a month to produce a complete generation. The eggs are laid in heaps of several dozens each; the author once found in one heap 107 eggs, but he is unable to say whether all these eggs were laid by one or by several insects. The heaps usually appear at the connections of the lateral with the central vein of the leaf; on the leaves of radish, which are covered by small hairs, the eggs are laid between the veins. After 7 to 8 days the larvae emerge, but a very considerable number of eggs appear to perish without hatching. The author counted on some leaves as many as 700-900 eggs, but never found more than 107 larvae on any one leaf, and he was unable to discover the cause of the failure of the eggs to hatch out. The majority of the larvae appeared on the plants between the 26th and 28th June. The insects were observed on the plants in all stages from egg to imago at the same time, and the last eggs were seen on the 18th July. The larva eats into the leaves and forms small burrows in the parenchyma. The veins of the leaves are seldom gnawed through, the larva going usually round them. Larvae were rarely found on the petioles. Under some conditions the larvae pass from one plant to another. Pupation takes place chiefly on the leaves or in the earth, if the larvae drop from the leaves. In some cases the author noticed pupae on the leaf petioles. The larval stage lasts from 12 to 16 days, the pupal 8 to 9 days, so that the whole period of transformation takes place in about 31 days.

Reasons are given for supposing, contrary to the usual statements, that *P. nemorum*, and perhaps also *P. sinuata*, produces a second generation in the year. In order to determine the time of the death of the hibernated insects, the author kept, during the whole summer, two beds of cabbage in which he replaced the plants as fast as they were eaten by the beetles, without interfering with the latter. Under these conditions the hibernated insects began to die about the 23rd of July, and practically all were dead by the middle of August.

The author recommends the destruction of the Cruciferous weeds as being one of the best methods of fighting *P. nemorum*. This will leave the insects after the winter without food for a few weeks and the great majority of them will perish. The best and easiest way of attacking them in the hot-beds is stated to be fumigation with tobacco-smoke. Outside the hot-beds the methods recommended are divided into measures for destroying the insect and preventive methods.

The best insecticide is Schweinfurt green, the following recipes being given:—For young seedlings: 50 grms. of Schweinfurt green (no. 707), 50 grms. of caustic lime, 100 litres of water, and 1 lb. of rye flour; or, 150 grms. of Schweinfurt green, 350 grms. of caustic lime, 125 litres of water, and 800 grms of rye flour. For older plants (more than 3-4 weeks): 200 grms. of barium chloride, 12 litres of water, and 1 glass of black molasses.

The author recommends the use of an entomological net, with which, he says, it is possible to catch great numbers of insects; he quotes a statement by J. F. Schreiner, who caught in this way 24,960 insects in 5 minutes. Another appliance mentioned is a racquet covered with some sticky substance and having a handle about 7 feet long. The strewing of hay on the gardens in the autumn, before the insects retire to their place of wintering, is also said to be a useful trap. The cover thus formed attracts them and they may be destroyed by setting fire to the hay. The author also recommends strewing horse-dung over the beds, the ammonia which is given off being said to kill or keep away the insects.

Amongst preventive measures the author gives:—(1) smoke; (2) sand or gravel spread between the plants [the reason why the insects avoid this is not sufficiently explained and is apparently unknown]; (3) sprinkling the plants with an infusion of wormwood; (4) basic slag; (5) sprinkling the plants with manure water; and (6) petroleum, which is best applied by scattering earth impregnated with petroleum over the beds; the author describes his own experiments with this method, which gave excellent results.

The author adds the following note on *Anthonomus pomorum*, L. Starting his investigations on the 15th April, he found three weevils under the rough bark of old apple trees. The warm weather of the 16th to 19th April brought out the insects from their winter homes, and on the following day the author syringed some trees with a solution of lime. A few days later it was necessary to repeat the syringing as the solution had been washed off by rain, and this again rendered a third syringing necessary. The number of *A. pomorum* found on the trees increased daily and on the 1st May the first pairing was observed. On the 2nd it was decided to shake the trees and the results showed that the trees treated with lime contained none or only single specimens of the insect, whereas the other trees yielded dozens of them. The author considers this season to be the most suitable for attacking the pest, as it is at this time that it lays its eggs. Further experiments confirmed the good effect of lime. The lime does no injury to the trees, but on the contrary is beneficial. The author also describes experiments as to the time these insects can live without food, and comes to the conclusion that it is from 5 to 11 days, depending upon the temperature and moisture. The higher the temperature and the drier the air, the more quickly they perish.

Baranov (A. D.). ПОЛЕВЫЕ ВРЕДИТЕЛИ [Field pests].—Матеріалы по изученію вредныхъ насѣкомыхъ Московской губерніи. [Materials for the study of the injurious insects of the Government of Moscow during the year 1912].—Published by the Zemstvo of the Government of Moscow, 1912 13, pp. 83–101.

The following injurious insects have been noticed in the fields in 1912. *Oscinis frit*, L., *Mayetiola* (*Cecidomyia*) *destructor*, Say, *Euxoa* (*Agrotis*) *segetum*, Schiff., *Phyllotreta vittula*, Redt.,

Ochsenheimeria taurella, Schiff., *Hylemyia coarctata*, Fall. *Sitones lineatus* L., *Apion apricans*, Hbst., *Phytonomus* sp., *Anthothrips aculeata*, *Agriotes lineatus*, L., and *Siphonophora cerealis*, Kalt.

Oscinis frit, L.—This insect winters, in the Government of Moscow, in both the larval and pupal stages, the proportion being 10-15 pupae to 100 larvae. The first spring brood of the flies emerged about the 2nd June, and on the 5th June the author noticed them pairing on the summer-sown barley, wheat, and oats, oviposition taking place 1-2 days after pairing. The author discovered the first eggs on the 8th June, from which date their number steadily increased, reaching its maximum between the 11th May and 15th June. The eggs are laid on different parts of the plant, but mostly on the upper side of the leaf, near the stalk, between and parallel with the veins of the leaf. After the larva emerges the shell of the egg is mostly found at the point of entrance of the larva into the plant, so that evidently it carries the shell with it. The development of the egg takes 4 days (Wildham puts it at 2-5 days, and Rerig 3-7 days), the first larvae having been observed on 12th June. The larval stage occupies 14-15 days, and pupation takes place near the roots of the plants, sometimes even at a depth of 1-2 inches in the earth. The first pupae were noticed on the 27th June, at which time the author found all stages of the insect, imago, eggs, larvae, and pupae on the summer-sown grain. The pupal stage lasts 10-12 days, and the second brood began to emerge on 7th July, continuing to do so for nearly a month. The author was unable to observe the flight of the third brood in the field, as there were at that time two generations of flies still about, but experiments conducted partly on a special plot covered with muslin, and partly in the laboratory, led him to assume that the flight of the third brood begins on the 25th August and that the descendants of this generation hibernate as pupae. From about 15 per cent. of the pupae of *Oscinis frit* the author obtained the parasites, *Rhoptomeris wildhami*, Kour., and *Trichomanus cristatus*, Foerster.

Phyllotreta vittula, Redt.—This beetle becomes yearly more numerous and the damage done by it to the summer-sown crops is increasing. The author never found it or noticed any damage done by it on the winter-sown crops. It winters in the province of Moscow in the imago stage among the roots of summer stubble and of *Triticum repens*. It emerges from the earth with the return of warm weather (the middle of May in 1912) and immediately attacks the sprouting grain. It does the most injury at the time of pairing, and at the beginning of June its injurious activity decreases. It feeds on the epidermis and parenchyma of the leaves, forming channels in them parallel with the veins. If the number of channels is not great the leaves may recover. The author did not succeed in finding eggs of this insect. The harm done to the plants by the larvae was considerably greater than that done by the adults, and the author noticed that the former sometimes pass over to another plant. The plants attacked by the larvae generally die or are greatly retarded in

their development. After the 15th June the insects decreased in numbers and by the beginning of July there remained only single individuals, but they reappeared on the 15th August in great numbers. As a remedy against this insect the author recommends:—(1) The destroying of *Triticum repens* in the fields and hedges and along roads, as these plants help the initial development of the insect; and (2) the sprinkling of the sprouting summer-sown corn and of *Triticum repens* with Schweinfurt green, taking for 55 gallons of water 1 lb. of green and 3 lb. of caustic lime.

Euxoa segetum, Schiff.—This insect has done considerable damage to the winter sowings in the districts of Voloklam, Klin, and Dmitrow, in the Government of Moscow. During 1912 the author searched for the caterpillars and pupae by digging in the fields, but neither in the spring nor in June did he succeed in finding any, and it was only in August that he discovered two caterpillars. He found no traces of the insect in the winter field of the village Orudjevo, in Dmitrow district, but in a field at Otchevo, only 3 versts (just under 2 miles) away, this beetle had totally destroyed one section and more than half of each of two adjoining sections, while in the remainder of the field there appeared isolated bare places. The field was re-sown from 19th-23rd August. Bare spots on the recently sown land were noticed by the peasants on the 2nd September and by the 8th September one section was completely destroyed. The greatest amount of injury was done between 3rd and 7th September. When the author reached this field, after the 8th September, the insect had already stopped feeding and disappeared into the earth to a depth of about 7 inches, the soil being very sandy, friable, and deeply ploughed. As a result of observations and enquiries the author recommends keeping the fields under bare fallow, leaving only a few patches of weeds. In these the insects will no doubt lay their eggs, and it will then be possible to destroy them by means of Schweinfurt green and barium chloride. According to the investigations of another author, Mr. N. S. Jachontow, the imago of *Euxoa segetum* flies in the month of June, when it should be possible to catch it by the use of molasses.

Control by the use of molasses is, the author says, cheaper than any other method and is exceedingly simple, but unfortunately he does not explain the mode of operation. The head of the Entomological Station of Tula states, the cost of application for 100 dessiatines (about 270 acres) to be as follows:—

	s.	*d.*
Horse work	1	7
20 wooden troughs	10	7
Wages of 1 day labourer	0	10
5 pud (82 kilos) of molasses	2	2
Yeast	0	2
Total	15	4

By the use of the molasses method on a large estate in Kiev in 1907, 98,444 moths of the first brood were captured in May and June and, in July and August, 46,710 of the second brood; when it is considered that each female represents a possible 300 larvae, the amount of destruction prevented by these captures was very great.

Ochsenheimeria taurella, Schiff.—This insect is very widespread in the winter-sown fields of the province, especially in the districts of Zvenigorodsk and Bronnitzk, where it has caused great injury. The author noticed some winter rye with two holes near the root, but in these plants he never found the larvae, whereas he obtained them from plants with only one hole near the root; which leads him to assume that the larvae are able to pass from one plant to another. At the beginning of July he found the pupae usually between the leaves and the stalks.

Mayetiola (Cecidomyia) destructor, Say.—This insect has not as yet invaded the province to any extent. The author did not find any damaged plants or any pupae in the fields examined; but in the grounds of the Agricultural Institute he found in the month of April 93 pupae. The plots in this field had been sown in May of 1911 with winter wheat, which remained standing for the whole of summer and autumn. The pupae were taken to the laboratory and the first flies emerged on the 13th May, and the last on 31st May, with the maximum on the 24th. After the 1st June parasites emerged from the pupae, all of which proved to be *Polygnotus minutus*, Lind. The proportion of pupae parasitised was approximately 15 per cent.; there being 5-8 larvae in each of the infested pupae.

Agriotes lineatus, L.—This insect appeared in certain fields about the end of May and in some places it had done considerable damage to the summer-sown oats and to clover. It was found about 2 inches under the soil eating away the neck of the roots. In the autumn it appeared again in great numbers in several winter-sown fields. In one field, near the station of Nemtchinov on the Alexandrow Railway, it totally destroyed half a field, in which the soil was very soft and friable in consequence of deep ploughing and abundant manuring; whereas the other half of the field, where the soil was harder, was free from the insect. As a remedy the author recommends baits of potatoes and linseed cake, poisoned with white arsenic and Schweinfurt green, to be put in the earth between the seeds at a depth of about 1½-2 inches.

Apion apricans, Herbst.—This insect appeared in the clover fields in the spring. The pairing was observed at the beginning of May and soon afterwards plants were to be found with their leaves perforated. On and after 8th June eggs of *A. apricans* were observed on the blossoms of clover and the larvae on the 12th June. On some heads of bloom as many as 40-50 larvae were found. Pupae were noticed on the 26th May, from which the beetles emerged on the 2nd June. With the larvae of this insect were also found those of *Phytonomus sp.* The latter is three times the size of the former. These larvae pupated on the 28th June, and the beetles emerged on the 5th July.

NOTICES.

The Review of Applied Entomology is intended to contain, month by month, abstracts of the latest information published concerning insects injurious to man or animals, as the carriers of disease; and to forests, fruit trees, crops or stored merchandise.

The Editor will be glad to receive prompt information of the appearance of new pests, or of known pests in districts which have hitherto been free from them, and will welcome any suggestion, the adoption of which would increase the usefulness of the Review.

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CONTENTS.

	PAGE.
Vanessa californica in California and Oregon in 1911-1912	177
The Horse-radish Web-worm in Colorado	177
The Cherry Saw-fly in California	178
Feeding Habits of *Pimpla conquisitor*, Say, in the United States	178
Cherry Fruit Flies in the United States	178
The Insect Pests of Arizona	179
Pests of Walnuts and Blackberries in Connecticut ...	181
Experiments with Roentgen Rays upon the Cigarette Beetle	181
Laphygma frugiperda in Porto Rico	181
Lygus pratensis in Missouri	182
Apple Leaf-hopper (*Empoasca mali*) in U.S.A.	182
Alabama argillacea in Peru	183
Mexican Sugar-cane Insects	183
The Mexican Sugar-cane Tingid	184
Insects affecting Sugar-cane in Porto Rico	184
The Life-Cycle of *Lachnosterna tristis* in Indiana ...	185
Movement of the Cotton Boll Weevil in U.S.A. in 1912 ...	185
Sacbrood, a Disease of Bees in U.S.A.	186
White Flies in Florida	186
The Beet Aphis in the North of France	188
An *Aspidiotus* new to Britain	188
The Control of the Japanese Fruit Scale (*Diaspis pentagona*)	188
Vesperus xatarti damaging Vineyards in Spain	189
Hemp as a Deterrent of *Pieris brassicae*	191
Carbide Lime as an Insecticide	191
Remedies for Fruit Fly in Queensland	192
Notes on the Bean Fly (*Agromyza*) in Queensland ...	192
Potato Grub in Victoria	193
A Pest of Seedling Trees in New Zealand	193
Methods for Destroying Cutworms in German East Africa	194
A New Insect Pest of Roses. The Vine Curculio (Weevil) (*Orthorrhinus klugi*)	195
Mally Fruit Fly Remedy in Pretoria	195
Arsenate of Lead. Composition of Various Brands sold as Insecticides	197
Experiments with Locust Bacterial Disease in South Africa	197
Insect Pests in St. Vincent	198
A Key to the Palaearctic Scolytidae	198
A German Text-book of Forest Entomology	199
Caterpillars Injurious to Herbaceous Plants	199
Necessity for the Use of Lead Arsenate in Agriculture ...	200
Two Spruce Leaf-Miners in Maine, U.S.A.	200
Spruce Bud-worm (*Tortrix fumiferana*) in Maine, U.S.A.	201
The Potato Flea Beetle in Maine, U.S.A.	202
Is it possible to prevent the Black Cecidomyia from Laying Eggs on Pear Trees?	204
Melon Aphis in Florida	204
Injurious Insects in the Govt. of Moscow in 1912 ...	205
Phyllotreta nemorum and *Anthonomus pomorum* in Russia	210
Injurious Insects in the Govt. of Moscow in 1912 ...	213